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RESEARCH MEMORANDUM

ALTITUDE COMPONENT PERFORMANCE OF THE YJ73-GE-3

TURBOJET ENGINE

By John E. McAulay and Carl E. Campbell

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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

RESEARCH MEMORANDUM

ALTITUDE COMPONENT PERFORMANCE OF THE YJ73-GE-3 TURBOJET ENGINE

By John E. McAulay and Carl E. Campbell

SUMMARY

An investigation to determine the altitude performance characteristics of the YJ73-GE-3 turbojet engine was conducted in an altitude chamber of the NACA Lewis laboratory. The engine was equipped with variable inlet guide vanes. The component performance was determined at two positions of the inlet guide vanes over a range of engine speeds, exhaust-nozzle areas, and flight conditions. The range of flight conditions covered corresponds to a variation in compressor Reynolds number index from 0.96 to 0.12.

A reduction in Reynolds number index over approximately the range indicated resulted in a decrease in the corrected air flow of $4\frac{1}{2}$ percent and in compressor efficiency of 6 percent. By operating the engine with the inlet guide vanes closed, the compressor steady-state performance was improved at corrected engine speeds below 6300 rpm. For example, at a corrected engine speed of 5600 rpm, the compressor efficiency was raised from 0.73 to 0.82 as the inlet guide vanes were moved from the open to the closed position. At rated engine conditions at a flight Mach number of 0.8, the combustion efficiency varied from 0.98 to 0.96 as altitude was varied from sea level to 55,000 feet. Within the range of this investigation, turbine efficiency varied about 4 percent. About half this variation is due to the effect of turbine-inlet Reynolds number, while the remaining half is due to changes in the turbine operating point.

INTRODUCTION

An investigation to determine the altitude performance and operational characteristics of the YJ73-GE-3 turbojet engine was conducted in an altitude chamber of the NACA Lewis laboratory. As part of this investigation, the performance of the components operating in the engine was obtained and is presented herein. The engine discussed herein is the production version of the J73 and is

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equipped with variable inlet guide vanes to avoid compressor surge during acceleration at low engine speed. The component performance is shown for operating conditions that occur over a range of engine speeds at four fixed exhaust-nozzle areas with the inlet guide vanes in both the open and closed positions. Simulated flight conditions varied from altitudes of approximately sea level to 55,000 feet and flight Mach numbers from zero to 1.2 (corresponding to a Reynolds number index range from 0.96 to 0.12). All data were taken with the inlet screens retracted.

APPARATUS

Installation and Instrumentation

The altitude-chamber test section in which the engine was installed is 14 feet in diameter and 20 feet long (Fig. 1). A photograph of the engine installed in the test chamber is shown in figure 2. The platform on which the engine was rigidly mounted is connected by a linkage to a balance-pressure diaphragm for measuring engine thrust. A honeycomb is installed in the chamber upstream of the test section to straighten and smooth the flow of the inlet air. The front bulkhead, which incorporates a labyrinth seal around the forward end of the engine, prevents the flow of combustion air directly into the engine compartment and exhaust system and provides a means of maintaining a pressure difference across the engine. A bellmouth cowl was installed on the front bulkhead just ahead of the engine to obtain a smooth flow of air into the compressor.

Air supplied to the inlet section of the altitude chamber can be either heated or refrigerated. Exhaust gases from the jet nozzle pass through an exhaust section, a primary cooler, an exhaust header, and a secondary cooler before entering the exhaust system. The inlet and exhaust pressure controls were designed to automatically maintain constant the desired ram pressure ratio and exhaust pressure.

The location of the instrumentation stations throughout the engine is shown in the cross-sectional sketch of figure 3. Also shown on this figure is a table giving the number of pressure tubes, wall static orifices, and thermocouples at each station. All pressures were measured by means of alkazene or mercury manometers and were photographically recorded. Temperatures were measured with iron-constantan and chromel-alumel thermocouples and were recorded by self-balancing potentiometers. Engine speed was measured by a chronometric tachometer and fuel flow by means of a calibrated rotameter.

Engine

At static sea-level conditions the YJ73-GE-3 turbojet engine has the following ratings:

	Military	Normal
Engine speed, rpm	7950	7615
Exhaust-gas temperature, °F	1185	1085
Thrust, lb (screens retracted)	8920	7840
Specific fuel consumption, lb/(hr)(lb thrust)	0.917	0.887

Compressor-outlet leakage and bleed air are used to provide a balance piston force at the front of the compressor and to cool the turbine disks and the first-stage turbine stator. This air is eventually returned to the main air stream before it passes through the exhaust nozzle.

The standard fixed-area conical exhaust nozzle has a nominal diameter of 21 inches. This nozzle was sized to give limiting exhaust-gas temperature at rated engine speed at static sea-level conditions. In addition, three larger exhaust nozzles were also installed on the engine during the program. The largest exhaust nozzle used had an exit area slightly larger than the turbine-outlet area.

Compressor

The 12-stage axial-flow compressor is shown in figure 4(a). The 21 variable inlet guide vanes rotate simultaneously through an angle of 30° from the open to the closed position. In the open position, the angles between the engine center line and a line tangent to the leading and trailing edges of the guide-vane airfoil sections at the root and the tip are 0° and 13°, respectively. The inlet guide vanes change position at an engine speed of 6800 rpm, going from the closed to the open position as speed is increased. The rate at which this change is made is independent of engine characteristics.

The significant compressor design parameters are:

Blade-tip diameter (constant), in.	32 $\frac{1}{8}$
Rotor hub-tip radius ratio	
First stage	0.46
Last stage	0.88

At an engine speed of 7950 rpm and compressor pressure ratio of 7.0 (static sea level),

Air flow, lb/sec	¹ 143
Air flow per sq ft of frontal area	25.4
Compressor efficiency	¹ 0.81
Compressor-inlet tip Mach number	0.997

Combustor

The combustor used in this engine is of the cannular type, consisting of an annular space containing 10 can-type liners (fig. 4(b)) that are connected to the turbine-inlet annulus by transition sections. Two spark-plug-type ignitors, located in liners diametrically opposite, are employed for engine starting. Large elliptical cross-over tubes between liners are used to facilitate flame propagation during high-altitude starting. Fuel is supplied to a dual-element fuel nozzle in each combustor primary zone. A fuel-flow divider ahead of the fuel nozzles determines the division of the fuel to the small and large orifices of each fuel nozzle.

The maximum combustor flow area, which is an annular area, is 5.3 square feet and results at rated conditions in an average reference velocity of about 95 feet per second in the combustor primary zone.

Turbine

The two-stage axial-flow turbine rotor is shown in figure 4(c). The significant turbine design parameters are:

Blade-tip diameter, in.	
First stage	29 $\frac{1}{2}$
Second stage	31 $\frac{1}{8}$
Hub-tip radius ratio	
First stage	0.73
Second stage	0.64
Average radial tip clearance, in.	0.05
Rated turbine-inlet temperature, °R	2020
Rated corrected turbine speed, rpm	4040
Design corrected work, Btu/lb	28.5
Design corrected weight flow, lb/sec	42

¹From manufacturer's compressor-rig tests.

The first-stage turbine stator contains internal passages through which cooling air from the compressor leakage is passed. The second-stage turbine stator blades increase in height from leading to trailing edge by an amount corresponding to the previously mentioned change in turbine tip diameter between the two stages.

PROCEDURE

A temporary limitation in the refrigeration system occurred during the period of this investigation when most of the data were obtained, and thus the inlet-air temperatures were confined to a range between 60° and -20° F. Limited data were taken later when it became possible to obtain inlet temperatures of -80° F and below. The preponderance of the data (given in table I) were obtained in the earlier period, and the later data (table II) were undertaken only to extend the data to higher values of corrected engine speed.

The following table indicates the range over which the earlier data were obtained with four different exhaust nozzles:

Nominal pressure altitude, ft	Nominal flight Mach number, M_0	Average Reynolds number index	Nominal engine-speed range, rpm	Inlet-guide-vane position
Sea-level	0	0.96	5500-7950	Open
	0	.96	3600-7950	Closed
15,000	0.8	0.88	5500-7950	Open
25,000	0.8	0.59	5500-7950	Open
35,000	1.2	0.58	5500-7950	Open
	.8	.39	5500-7950	Open
	.8	.40	4500-7950	Closed
45,000	0.8	0.24	5500-7950	Open
55,000	0.8	0.15	5500-7950	Open
	.4	.12	5500-7950	Open

The later data were taken only at altitudes of 35,000 feet and above with the inlet guide vanes open. Although the flight conditions of these data correspond to the data listed above, the Reynolds number indices differ, inasmuch as these data were taken at a considerably lower inlet-air temperature.

The fuel used throughout the investigation was MIL-F-5624A, grade JP-4, with a lower heating value of 18,700 Btu per pound and a hydrogen-carbon ratio of 0.168. The symbols and methods of calculation used in this report are given in appendixes A and B, respectively.

RESULTS AND DISCUSSION

The performance is presented herein for each component over a range of operating conditions as an independent component and also as a component operating in the engine. The data in this report are presented for various values of Reynolds number index, not altitude and Mach number. In order to correlate these data with flight conditions, the variation of Reynolds number index with altitude and flight Mach number for standard NACA conditions is shown in figure 5.

Compressor Performance

Performance maps. - The compressor performance is presented by showing lines of constant corrected engine speed (compressor Mach number) and compressor efficiency on coordinates of compressor pressure ratio and corrected air flow. Performance maps with the inlet guide vanes in the closed position are presented in figures 6(a) and (b) at the two Reynolds number indices for which complete data were obtained, namely, 0.96 and 0.40. Within the accuracy of the data, a given corrected engine speed resulted in only one compressor pressure ratio for corrected engine speeds of 6000 rpm or lower. The peak compressor efficiency occurred at a corrected engine speed of 6000 rpm and decreased from 0.82 to 0.79 as Reynolds number index decreased from 0.96 to 0.40. This same change in Reynolds number index had little or no effect on corrected air flow.

With the inlet guide vanes in the open position, data were taken over a sufficient range of Reynolds number indices to define clearly the Reynolds number effect. Performance is presented in the compressor map (fig. 6(c)) at Reynolds number index of 0.39 and in figure 7, which shows the variation of corrected air flow and compressor efficiency with Reynolds number index for constant values of corrected engine speed and compressor pressure ratio. Data at Reynolds number index of 0.39 were selected for figure 6(c) because of the high corrected engine speed data that were available. A peak compressor efficiency of slightly over 0.84 occurred at a corrected engine speed of about 7100 rpm and a compressor pressure ratio of 5.5. At rated corrected engine speed, the compressor efficiency decreased to 0.81 and the corrected air flow was about 141 pounds per second. Within the range of exhaust-nozzle areas used to obtain the data, variation in compressor pressure ratio at a given corrected engine speed resulted in small changes in compressor efficiency of the order of 0.02 or less. At corrected engine speeds above 7000 rpm, variations in pressure ratio had little effect on corrected air flow; while at speeds below 7000 rpm, the corrected air flow increased as pressure ratio was reduced.

3167 Effect of Reynolds number. - The effects of Reynolds number on compressor efficiency and corrected air flow are presented in figure 7. A careful examination of the data obtained at Reynolds number indices other than 0.39 has shown these curves to be valid for open-inlet-guide-vane operation at all compressor pressure ratios at corrected engine speeds of 6800 rpm and above. For a given corrected engine speed and compressor pressure ratio, the ordinates of figure 7 give the ratio of the compressor efficiency and corrected air flow at any Reynolds number index to the compressor efficiency and corrected air flow at a Reynolds number index of 0.39. Thus, the corrected air flow and compressor efficiency can be obtained for a Reynolds number index of 0.39 (fig. 6(c)) and corrected to any desired Reynolds number index (fig. 7) within the range investigated.

The effects of Reynolds number as shown in figure 7 are to reduce the compressor efficiency about 6 percent and the corrected air flow about $4\frac{1}{2}$ percent as Reynolds number index is decreased from 0.96 to 0.12. The decreases in compressor efficiency and corrected air flow with Reynolds number index are small until Reynolds number index is reduced below 0.5.

Comparison of compressor performance with inlet guide vanes in open and closed positions. - A comparison of the performance with open and closed inlet guide vanes is presented in figure 8 at a Reynolds number index of 0.96. In this figure, compressor pressure ratio, efficiency, and corrected air flow for the rated exhaust-nozzle area are shown as functions of corrected engine speed. Also shown are the pressure-ratio stall lines for the two inlet-guide-vane positions. The range of corrected engine speeds over which the inlet guide vanes will change position is also indicated. It can readily be seen that, at low corrected engine speeds (below 6300 rpm), an improvement in the steady-state compressor performance may be obtained by operating with the inlet guide vanes in the closed position; at corrected engine speeds above 6300 rpm, the opposite is true. At a corrected engine speed of 5600 rpm, for example, changing the inlet guide vanes from the open to the closed position resulted in no change in pressure ratio, an increase in corrected air flow from 70 to 72 pounds per second, and an increase in compressor efficiency from 0.73 to 0.82. The surge lines indicate about the same margin of acceleration (in terms of pressure ratio) for either guide-vane position. Consideration of the steady-state performance and surge lines would indicate that, in general, a lower switch-over speed than that provided would be advantageous. Engine acceleration characteristics, which are beyond the scope of this report, are not completely determined by the variables shown in figure 8, however. No final selection of switch-over point should be made, therefore, without consideration of acceleration characteristics.

Performance maps for compressor operating as part of engine. - In order to identify the compressor performance with engine operating conditions, lines of constant corrected turbine-inlet temperature are superimposed in figure 9 on the compressor maps obtained at Reynolds number indices of 0.96 and 0.12, the limits over which the investigation was conducted. Also superimposed on each map is a line showing the mode of operation with rated exhaust-nozzle area.

At a Reynolds number index of 0.96 (fig. 9(a)), with the engine operated at rated corrected engine speed and exhaust-nozzle area, the compressor pressure ratio was 7.0, the corrected air flow 143 pounds per second, the compressor efficiency 0.82, and the corrected turbine-inlet temperature 2020° R. As Reynolds number index was reduced to 0.12 (fig. 9(b)), at the same corrected engine speed and exhaust-nozzle area, the compressor pressure ratio remained at 7.0, the corrected air flow and compressor efficiency decreased to 136 pounds per second and 0.78, respectively, and the corrected turbine-inlet temperature was raised to 2180° R. As noted previously, the reductions in corrected air flow and compressor efficiency are due to Reynolds number effects on the compressor. A similar effect on the turbine performance will be shown in a later section. These Reynolds number effects were of such magnitude and direction that a constant compressor pressure ratio and an increased corrected turbine-inlet temperature resulted.

For both Reynolds number indices, the operating line for rated exhaust-nozzle area passed through the region of maximum compressor efficiency.

Pressure loss through the compressor-outlet diffuser. - The loss in total pressure in the diffuser between the compressor and combustor may be expressed in terms of total-pressure loss ratio (pressure loss divided by inlet pressure). Over the entire range of this investigation this total-pressure loss ratio was about 0.6 percent.

Combustor Performance

Combustion efficiency. - As shown in reference 1, combustion efficiency for several combustors correlates with combustor-inlet conditions $P_4 T_3 / V_b$. Combustion efficiency is presented as a function of $P_4 T_3 / V_b$ in figure 10. Over the range that the combustor operated in this engine, the fuel distribution and fuel-air ratio were found to have negligible effect on this correlation. An auxiliary scale of $W_{a,1} T_7$, which is proportional to $P_4 T_3 / V_b$, is also shown, because it is considered a more practical parameter insofar as engine operation

is concerned. The combustion efficiency was constant at 0.98 above $P_4 T_3 / V_b$ of 35,000 ($W_{a,1} T_7$ of 52,500). A decrease in combustion parameter below this value resulted in a decrease in combustion efficiency to 0.83 at $P_4 T_3 / V_b$ of 6000. Thus, at rated engine conditions and a flight Mach number of 0.8, the combustion efficiency remained at 0.98 up to an altitude of about 37,000 feet ($P_4 T_3 / V_b$ of 35,000) and decreased to 0.96 at an altitude of 55,000 feet ($P_4 T_3 / V_b$ of 23,000).

Combustor total-pressure loss. - The combustor total-pressure loss ratio is presented as a function of combustor temperature ratio in figure 11. Data for all Reynolds number indices fall along a single curve. The pressure loss ratio decreased from 0.075 to 0.037 as combustor temperature ratio increased from 1.0 to 2.2 (approximately the combustor temperature ratio at rated conditions).

Combustor-outlet temperature distribution. - The data presented in figure 12 are typical temperature profiles at the turbine outlet. Previous investigations have indicated that turbine-outlet profiles reflect the combustor-outlet profiles, although in somewhat diminished magnitude. The turbine-outlet station is used, because no reliable temperature measurements were available at the combustor outlet. There were no consistent effects of altitude, flight Mach number, engine speed, or temperature level on the combustor temperature distribution. The data of figure 12 indicate that the radial temperature distribution with which the rotor would be concerned is relatively flat. However, the circumferential temperature variations are of considerable magnitude, amounting to 12 percent above the average (probably more ahead of the turbine). Therefore, near rated temperatures the local temperature may be more than 200° F above the average. Although this circumferential unbalance is unimportant insofar as the rotor is concerned, it could be detrimental to the stator life. No adverse effects on stator life were observed during the testing reported herein, which included over 170 hours of engine operation at various conditions without engine overhaul.

Turbine Performance

Performance map. - The performance of the turbine is presented in terms of corrected enthalpy drop and turbine gas-flow parameter with lines of constant corrected turbine speed, turbine pressure ratio, and turbine efficiency. Data for compressor Reynolds number indices of 0.96 and 0.88 were combined to construct the map shown in figure 13. For these compressor Reynolds number indices, the turbine Reynolds number index varied nominally from 0.90 to 1.50. A check showed that

turbine Reynolds number had a negligible effect over this range of turbine Reynolds number indices. Therefore, the map of figure 13 was constructed from all data that fell within this turbine Reynolds number index range. Because of the variable inlet guide vanes used on this engine, it was possible to obtain turbine performance over a much wider range of enthalpy drop (at a constant corrected turbine speed) than is usually possible in engine performance evaluations.

At rated static sea-level conditions, the turbine operated at a corrected turbine speed of 4040 rpm and a corrected enthalpy drop of 30.0 Btu per pound. This operating point on the map of figure 13 (which approximates the static sea-level condition) corresponded to a turbine pressure ratio of 2.96, a corrected turbine gas flow of 43.0 pounds per second, and a turbine efficiency of 0.87. From the turbine weight-flow parameter, it may be determined that increasing the corrected turbine speed from 3900 to 4600 rpm resulted in about a $2\frac{1}{2}$ -percent reduction in the corrected turbine gas flow. Thus, the critical turbine flow area decreased as corrected turbine speed was increased, which indicated that the critical turbine flow area was downstream of the first-stage stator.

The peak turbine efficiency, which was slightly over 0.87 for the data shown in figure 13, occurred at a corrected turbine speed of about 4150 rpm. Over the entire range of turbine operation in figure 13, the efficiency varied less than 0.02. At any given corrected turbine speed, changing the turbine pressure ratio had no discernible effect on corrected gas flow or efficiency within the range investigated.

Effect of Reynolds number. - The effect of turbine Reynolds number on turbine efficiency and corrected turbine gas flow at a given corrected turbine speed and pressure ratio is presented in figure 14. The reference Reynolds number index of 1.50 was used so that figures 13 and 14 could be used together in determining turbine performance. The trends shown in figure 14 are valid over the range of turbine operating conditions presented in figure 13. The effect of reducing the turbine Reynolds number from 1.50 to 0.15 was to decrease the corrected turbine gas flow 2 percent and the turbine efficiency $2\frac{1}{2}$ percent.

Altitude Performance of Components at Rated Conditions

The variation of component performance with altitude at a flight Mach number of 0.8 is presented in figure 15 for rated engine conditions (rated exhaust-nozzle area and either limiting engine speed or exhaust-gas temperature). Increasing altitude from sea level to 55,000 feet

3167
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results in an increase in corrected engine speed from 7480 to 8610 rpm and a decrease in Reynolds number from 1.31 to 0.17. The corrected engine speed of 8610 rpm is reached at the tropopause and remains constant as altitude is raised above this value. Compressor efficiency decreased from 0.842 to 0.768 as altitude was increased from sea level to the tropopause. Practically all of this decrease resulted from the increased corrected engine speed, while the effect of Reynolds number up to the tropopause was negligible. As altitude was increased to 55,000 feet, a further reduction of compressor efficiency to 0.753 occurred entirely because of Reynolds number effects. As can be seen in figure 15, the reduction in compressor efficiency would have been greater (to 0.744), except that it was necessary to reduce the engine speed in order to maintain turbine temperature limits.

The corrected air flow increased from 134.9 to 146.7 pounds per second as altitude was raised to the tropopause (assuming that corrected air flow is constant above a Reynolds number index of 0.96, i.e., fig. 7). This increase is due to the increase in corrected engine speed, which overshadowed the relatively small decrease associated with Reynolds number. As altitude was increased beyond the tropopause to an altitude of 55,000 feet, the corrected air flow was reduced to 142.9 pounds per second because of the effect of Reynolds number and the previously mentioned reduction in engine speed.

An increase in the altitude from sea level to 55,000 feet resulted in a small decrease in combustion efficiency from 0.98 to 0.96. This reduction, of course, would increase if lower values of flight Mach number or engine speed were considered, inasmuch as combustion efficiency is primarily a function of the combustor pressure level.

Turbine efficiency decreased from about 0.870 to 0.854 as altitude was raised from sea level to 55,000 feet. Over the range through which the turbine operates in the engine, turbine efficiency is a function only of corrected turbine speed and turbine Reynolds number (figs. 13 and 14). Because the corrected turbine speed remained nearly constant for rated engine conditions, the decrease in turbine efficiency resulted only from a decrease in turbine Reynolds number.

CONCLUDING REMARKS

Performance of the components of the YJ73-GE-3 engine was determined over a wide range of engine operating conditions and flight conditions. The effect of Reynolds number on the compressor performance at a constant corrected engine speed and compressor pressure ratio with the inlet guide vanes open was to reduce the corrected air flow $4\frac{1}{2}$ percent

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and the compressor efficiency 6 percent as Reynolds number index decreased from 0.96 to 0.12. At corrected engine speeds below 6300 rpm, the compressor performance can be improved by operating with the inlet guide vanes in the closed position. At a corrected engine speed of 5600 rpm, the compressor efficiency is raised from 0.73 to 0.82 as the inlet guide vanes move from the open to the closed position.

At rated engine conditions at a flight Mach number of 0.8, as altitude was increased from sea level to 55,000 feet, the compressor efficiency was reduced about 11 percent and the corrected air flow was raised about 6 percent primarily because of the effects of increased corrected engine speed.

The combustion efficiency remained at 0.98 at values of $P_4 T_3 / V_b$ of 35,000 and above, which corresponds to rated engine conditions at an altitude of 37,000 feet or less and a flight Mach number of 0.8. At the same engine and flight conditions at an altitude of 55,000 feet, the combustion efficiency was 0.96. At all Reynolds number indices the combustor total-pressure loss ratio was 0.037 for rated engine conditions.

Over the range of engine conditions investigated, at any given compressor Reynolds number index the turbine efficiency and the corrected turbine gas flow varied about 2 percent. As the turbine-inlet Reynolds number index was decreased from 1.50 to 0.15 at constant corrected turbine speed and turbine pressure ratio, the corrected turbine gas flow and the turbine efficiency decreased 2 and $2\frac{1}{2}$ percent, respectively. At rated engine conditions, as altitude was increased from sea level to 55,000 feet at 0.8 flight Mach number, a reduction in turbine efficiency of 2 percent was due only to the decrease in turbine Reynolds number.

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio, April 16, 1954

APPENDIX A

SYMBOLS

The following symbols are used in this report:

A	cross-sectional area, sq ft
g	acceleration due to gravity, 32.174 ft/sec ²
H	total enthalpy of air or gas mixture, Btu/lb
M	Mach number
N	engine speed, rpm
P	total pressure, lb/sq ft abs
p	static pressure, lb/sq ft abs
R	gas constant, 53.4 ft-lb/(lb)(°R)
Re	Reynolds number
T	total temperature, °R
V	velocity, ft/sec
V _{cr}	critical velocity, $\sqrt{\frac{2\gamma}{\gamma+1} gRT}$, ft/sec
W _a	air flow, lb/sec
W _f	fuel flow, lb/hr
W _g	gas flow, lb/sec

β function of $\gamma, \frac{1.4}{\gamma} \left[\frac{\left(\frac{\gamma+1}{2}\right)^{\frac{\gamma}{\gamma-1}}}{\left(\frac{1.4+1}{2}\right)^{\frac{1.4}{1.4-1}}} \right]$

γ ratio of specific heats

- δ pressure-correction factor $P/2116$ (total pressure divided by NACA standard sea-level pressure)
- η efficiency
- θ temperature-correction factor $(V_{cr}/1018)^2$ (squared ratio of critical velocity to critical velocity at NACA standard sea-level conditions)
- λ $\frac{Am + B}{m + 1}$, $\frac{\text{Btu}}{\text{lb of fuel}}$ (as defined in ref. 2)
- μ absolute viscosity, lb-sec/sq ft
- ρ density, lb-sec²/ft⁴
- ϕ viscosity-correction factor $\mu/3.719 \times 10^{-7}$ (viscosity divided by NACA standard sea-level viscosity)

Subscripts:

- a air
- b combustor
- c compressor
- g gas mixture
- i indicated
- t turbine
- 0 free-stream conditions
- 1 engine or compressor inlet
- 3 compressor outlet, compressor diffuser inlet
- 4 combustor inlet, compressor diffuser outlet
- 5 turbine inlet, combustor outlet
- 6 turbine outlet, tail-pipe diffuser inlet
- 7 exhaust-nozzle inlet, tail-pipe diffuser outlet

APPENDIX B

METHODS OF CALCULATION

Temperature. - Total temperatures were calculated from indicated temperatures by the following relation:

$$T = \frac{T_1 \left(\frac{P}{p} \right)^{\frac{\gamma - 1}{\gamma}}}{1 + 0.85 \left[\left(\frac{P}{p} \right)^{\frac{\gamma - 1}{\gamma}} - 1 \right]} \quad (1)$$

where 0.85 is the impact recovery factor for the type of thermo-couple used.

Reynolds number index. - For a given corrected engine or turbine speed, Reynolds number index varies linearly with Reynolds number and is defined as the ratio of Reynolds number at any condition to Reynolds number at standard sea-level conditions:

$$\text{Re index} = \frac{\delta}{\phi \sqrt{\theta}} \quad (2)$$

Air flow. - Air flow was determined from pressure and temperature measurements at the engine inlet (station 1) by the following equation:

$$W_{a,1} = \rho_1 A_1 V_1 = p_1 A_1 \sqrt{\left(\frac{2\gamma_1}{\gamma_1 - 1} \right) \left(\frac{g}{RT_1} \right) \left(\frac{P_1}{p_1} \right)^{\frac{\gamma_1 - 1}{\gamma_1}} \left[\left(\frac{P_1}{p_1} \right)^{\frac{\gamma_1 - 1}{\gamma_1}} - 1 \right]} \quad (3)$$

The various compressor-outlet bleed and leakage flows were determined to be about 2 percent of the inlet-air flow. Although portions of the flow reenter ahead of the turbine (after station 5) and between turbine stages, this flow was ignored insofar as station 6 is concerned. However, the entire bleed and leakage flow has reentered the mainstream flow before passing through the exhaust nozzle. The air or gas flows at the various stations were calculated by the following equations:

$$W_{a,3} = W_{a,1} \quad (4)$$

$$W_{g,5} = 0.98W_{a,1} + \frac{W_f}{3600} \quad (5)$$

$$W_{g,7} = W_{a,1} + \frac{W_f}{3600} \quad (6)$$

Compressor efficiency. - Compressor efficiency was calculated by use of the tables in reference 3 and neglecting water-vapor corrections. Using known values of compressor-inlet and -outlet total pressure and temperature, compressor efficiency was determined from the following expression:

$$\eta_c = \frac{H_{3,\text{isentropic}} - H_1}{H_{3,\text{actual}} - H_1} \quad (7)$$

Combustion parameter. - Combustion parameter $P_4 T_3 / V_b$ is most easily calculated by assuming that the burner-inlet Mach number is low enough that total and static values of temperature and pressure are nearly equal. Thus, it can be shown that

$$\frac{P_4 T_3}{V_b} = \left(\frac{A_b}{R} \right) \frac{P_4^2}{W_{a,4}} \quad (8)$$

where A_b is the maximum combustor flow area and is equal to approximately 5.3 square feet; and V_b , which is not a real velocity at the combustor inlet, is used according to criteria previously established in order that various combustors could be compared on a fair basis.

Combustion efficiency. - Combustion efficiency is defined as the ratio of the actual enthalpy rise of the gas while passing through the engine to the theoretical increase in enthalpy that would result from complete combustion of the fuel:

$$\eta_b = \frac{H_{a,7} + \frac{W_f}{3600W_{a,1}} \lambda_7 - H_{a,1}}{18,700 \frac{W_f}{3600W_{a,1}}} \quad (9)$$

where 18,700 Btu per pound is the lower heating value of the fuel.

Turbine-inlet total temperature. - Turbine-inlet temperature was calculated by the use of temperature-enthalpy tables and the following equation:

$$H_{g,5} = \frac{W_{a,1} (H_{a,3} - H_{a,1})}{W_{g,5}} + H_{a,7} \quad (10)$$

The difference in the fuel-air ratios between stations 5 and 7 is negligible with respect to calculation involving equation (10).

Turbine efficiency. - Turbine efficiency was obtained from the relation

$$\eta_t = \frac{1 - T_7/T_5}{\frac{\gamma_t - 1}{\gamma_t}} \quad (11)$$

$$1 - \left(\frac{P_6}{P_5} \right)$$

where γ_t is based on $\frac{T_5 + T_7}{2}$ and fuel-air ratio.

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TABLE 1. - PERFORMANCE DATA

(a) Inlet guide vanes open.

Run	Com- pressor Reynolds number $\frac{\rho_0 V_1}{\mu_1}$	Altitude- exhaust pressure, P_0 , lb/sq ft	Flight Mach number, M_0	Equi- valent ambient air static tempera- ture, T_0 , °R	Engine- inlet total tempera- ture, T_1 , °R	Engine- inlet total pressure, P_1 , lb sq ft abs	Compressor- inlet total pressure, P_2 , lb sq ft abs	Compressor- outlet total tempera- ture, T_3 , °R	Compressor- outlet total pressure, P_3 , lb sq ft abs	Compressor- inlet total pressure, P_4 , lb sq ft abs	Turbine- inlet total tempera- ture, T_5 , °R	Turbine- inlet total pressure, P_5 , lb sq ft abs	Turbine- outlet total tempera- ture, T_6 , °R	Turbine- outlet total pressure, P_6 , lb sq ft abs	Tail- pipe total tempera- ture, T_7 , °R	Tail- pipe total pressure, P_7 , lb sq ft abs
Exhaust-nozzle area, 2.388 sq ft																
1	0.922	2035	0	522	514	1852	1899	979	13616	15427	2050	12990	1891	4418	1632	4315
2	.925	2045	0	522	514	1842	1913	965	13175	12952	1967	12565	1824	4280	1872	4184
3	.928	2057	0	522	515	1944	1917	928	12022	11868	1810	11462	1470	3949	1444	3040
4	.938	2039	0	520	515	1970	1951	858	9578	9516	1560	9139	1248	3289	1247	3187
5	.959	2041	0	518	516	2014	2007	859	5897	5878	1430	5340	1247	2477	1212	2452
6	.862	1186	.803	448	506	1815	1785	989	12794	12668	2018	12189	1854	4146	1615	4045
7	.864	1187	.806	448	507	1819	1797	919	11326	11241	1780	10796	1448	3672	1419	3564
8	.861	1176	.812	448	507	1832	1794	848	8781	8728	1458	8358	1161	2807	1148	2758
9	.871	1189	.798	451	509	1809	1792	848	8733	8677	1443	8314	1157	2788	1142	2724
10	.881	1176	.811	450	509	1811	1805	844	4911	4887	1083	4805	848	1718	839	1684
11	.887	1183	.802	454	512	1808	1802	734	4793	4774	1087	4515	850	1702	848	1688
12	.877	769	.818	445	502	1195	1172	987	8515	8424	2028	8119	1635	2786	1623	2692
13	.875	775	.803	446	504	1185	1167	954	8150	8078	1958	7784	1561	2639	1556	2576
14	.875	782	.800	447	504	1192	1175	916	7425	7363	1790	7079	1441	2409	1422	2347
15	.875	788	.818	446	505	1188	1174	844	5926	5785	1484	5751	1175	1843	1152	1812
16	.576	774	.811	447	506	1192	1187	728	3162	3146	1055	2984	844	1124	840	1100
17	.578	484	1.21	394	509	1209	1189	974	8487	8419	2020	8090	1637	2785	1618	2698
18	.575	484	1.20	395	509	1201	1184	958	8175	8108	1953	7798	1583	2687	1580	2585
19	.578	411	1.21	394	510	1208	1181	921	7425	7363	1790	7136	1480	2484	1484	2347
20	.578	484	1.20	395	510	1204	1192	848	5769	5732	1480	5493	1165	1842	1149	1797
21	.578	486	1.22	395	512	1209	1205	726	5068	5031	950	2848	719	1248	722	1021
22	.582	489	.804	448	502	783	742	970	5315	5315	2033	5108	1641	1758	1628	1894
23	.582	485	.808	444	502	746	737	954	5190	5131	1950	4933	1610	1684	1588	1838
24	.587	480	.805	442	499	750	740	934	5039	4997	1900	4804	1581	1688	1588	1585
25	.582	490	.809	444	502	763	743	917	4770	4739	1800	4656	1488	1544	1431	1502
26	.587	481	.802	440	499	749	739	882	4381	4315	1845	4133	1385	1394	1319	1358
27	.582	508	.798	447	503	754	749	844	3835	3822	1478	3474	1189	1160	1170	1146
28	.587	482	.803	443	500	782	748	775	2761	2776	1220	2832	987	901	888	878
29	.582	482	.798	447	504	748	746	729	1974	1961	1083	1863	887	899	864	868
30	.220	501	.799	443	499	468	453	983	3263	3240	2020	5113	1858	1087	1814	1029
31	.223	504	.808	446	505	466	456	980	3231	3208	1990	5079	1635	1046	1590	1090
32	.225	507	.794	443	499	465	460	945	3143	3114	1940	2998	1597	1021	1590	993
33	.220	295	.619	444	503	458	452	922	2940	2915	1850	2808	1490	944	1452	916
34	.220	500	.804	443	500	459	454	891	2700	2688	1710	2577	1379	872	1361	846
35	.221	298	.618	444	503	459	454	848	2282	2268	1500	2171	1211	783	1168	701
36	.224	507	.800	443	500	468	465	804	1950	1943	1330	1861	1049	826	1061	807
37	.225	310	.795	447	503	470	468	739	1870	1865	1140	1201	895	445	912	435
38	.138	198	.781	458	515	284	292	965	1678	1678	2000	1808	1844	625	1803	804
39	.137	189	.808	457	518	290	288	943	1735	1744	1897	1672	1546	578	1519	581
40	.136	185	.818	457	518	287	284	919	1648	1642	1770	1672	1489	534	1413	519
41	.138	194	.791	480	518	293	280	883	1445	1440	1808	1374	1303	486	1284	453
42	.137	192	.782	480	518	290	288	800	932	929	1300	884	1087	322	1037	318
43	.100	192	.417	501	518	218	214	981	1365	1359	1971	1308	1837	454	1582	441
44	.101	195	.417	498	517	220	217	948	1360	1312	1907	1288	1597	439	1332	428
45	.101	195	.418	499	517	220	218	918	1209	1198	1805	1148	1494	395	1448	384
46	.101	198	.403	501	517	219	218	678	1042	1032	1643	987	1360	358	1320	347
47	.101	198	.399	501	517	221	220	621	873	870	1590	641	1368	264	1317	260

TABLE I. - Continued. PERFORMANCE DATA

(a) Continued. Inlet guide vanes open.

Engine speed, N, rpm	Corrected engine speed, $\frac{N}{\sqrt{\theta_1}}$ rpm	Compressor inlet tip Mach number, M_c	Engine air flow, $W_{a,1}$, lb/sec	Corrected air flow, $W_{a,1} \sqrt{\theta_1}$, lb/sec	Compressor pressure ratio, P_3/P_1	Compressor efficiency, η_c	Compressor discharge pressure ratio, $(P_3-P_4)/P_3$	Compressor pressure loss ratio, $\frac{P_4-P_5}{P_4}$	Combustion efficiency, η_b	Combustion parameter, $\frac{P_4 P_5}{P_4 P_5} \times 10^{-4}$	Combustion parameter, $W_{a,1} P_3 \times 10^{-4}$	Turbine Reynolds number index, $\frac{N}{\sqrt{\theta_5}}$ rpm	Corrected turbine gas flow, $\frac{W_{g,5} \sqrt{\theta_5}}{P_5}$, lb/sec	Turbine efficiency, η_t	Corrected turbine enthalpy drop, $\frac{\Delta H_t / \theta_5}{P_5}$, Btu/lb-sec	Turbine pressure ratio, P_6/P_5	Run	
Exhaust-nozzle area, 2.368 sq ft																		
7955	7993	1.002	131.3	145.1	7.046	0.814	0.014	0.033	0.988	13.9	21.4	1.23	4079	43.0	0.850	29.7	2.841	1
7792	7830	.982	129.7	140.7	6.785	.824	.017	.030	.979	13.1	20.4	1.17	4064	43.2	.867	29.8	2.838	2
7409	7439	.953	123.1	133.5	6.184	.847	.015	.034	.978	11.8	17.8	1.21	4018	43.0	.865	29.4	2.803	3
6880	6708	.841	107.1	114.8	4.882	.850	.007	.040	.982	8.58	13.4	1.16	3890	43.2	.862	22.5	2.798	4
5498	5514	.681	64.8	67.7	2.774	.715	.002	.042	.982	4.87	7.03	.74	3348	42.6	.843	21.8	2.158	5
7922	8023	1.008	124.0	142.9	7.057	.807	.010	.036	.977	14.3	20.0	1.15	4075	43.2	.872	30.0	2.940	6
7415	7508	.942	117.3	134.7	6.228	.833	.008	.040	.981	10.9	18.6	1.17	4051	43.1	.877	30.0	2.940	7
6888	6784	.848	100.8	116.4	4.846	.845	.006	.042	.993	7.65	11.6	1.14	4024	42.9	.887	30.0	2.978	8
6870	6735	.845	99.5	115.3	4.828	.853	.006	.042	.981	7.65	11.4	1.15	4042	42.3	.839	30.7	2.882	9
5502	5555	.697	66.3	76.7	2.712	.752	.005	.068	.981	3.85	5.56	.93	3683	43.3	.867	27.0	2.680	10
5496	5536	.694	62.3	72.8	2.654	.742	.004	.065	.974	3.69	5.38	.91	3875	41.8	.874	26.8	2.653	11
7953	8068	1.014	82.1	143.3	7.137	.804	.011	.038	.989	8.74	13.3	.77	4080	43.1	.888	30.0	2.936	12
7795	7910	.982	80.1	141.0	6.878	.813	.009	.039	.988	8.25	12.5	.76	4084	43.1	.878	30.0	2.942	13
7417	7527	.944	78.7	134.1	6.229	.833	.008	.039	.981	7.15	10.9	.77	4040	43.1	.874	30.0	2.939	14
6888	6780	.850	68.2	116.5	4.812	.851	.007	.040	.980	5.12	7.62	.78	4015	42.5	.882	30.0	2.912	15
5494	5584	.698	42.3	74.1	2.853	.789	.005	.058	.987	2.37	3.55	.59	3893	42.5	.888	27.0	2.656	16
7953	8031	1.007	82.2	142.4	7.020	.806	.008	.039	.985	8.73	13.3	.76	4088	43.2	.884	29.8	2.928	17
7792	7888	.987	80.3	140.1	6.806	.817	.008	.038	.985	8.29	12.5	.76	4088	43.1	.884	30.4	2.933	18
7420	7485	.938	76.7	133.5	6.206	.840	.008	.039	.977	7.28	10.8	.77	4044	42.7	.883	29.7	2.944	19
6892	6741	.843	65.3	114.7	4.792	.845	.006	.042	.982	5.05	7.58	.75	4019	42.6	.888	30.0	2.882	20
5492	5530	.693	43.3	75.2	2.826	.794	.008	.060	1.004	2.15	3.12	.68	4128	42.5	.845	29.4	2.610	21
7951	8064	1.014	81.8	142.7	7.109	.798	.007	.038	.978	8.84	13.4	.48	4070	43.2	.888	30.0	2.938	22
7788	7818	.985	80.2	139.8	6.857	.814	.008	.038	.985	8.35	7.88	.48	4080	43.3	.889	30.0	2.941	23
7531	7782	.978	80.1	138.5	6.719	.821	.008	.038	.984	8.05	7.33	.49	4038	42.8	.887	29.7	2.931	24
7420	7544	.948	48.8	154.9	6.338	.832	.007	.043	.971	4.68	6.98	.49	4031	42.9	.889	30.0	2.938	25
7097	7237	.906	48.1	127.8	5.782	.842	.004	.042	.974	4.09	6.08	.46	4005	42.6	.887	29.0	2.935	26
6870	6785	.848	41.3	113.7	4.832	.831	.009	.041	.940	3.22	4.83	.47	3990	42.8	.853	28.8	2.944	27
6013	6126	.768	34.9	95.5	3.688	.827	.002	.052	.954	2.23	3.34	.44	3977	43.1	.888	28.2	2.921	28
5482	5573	.699	25.6	71.4	2.839	.715	.007	.050	.984	1.56	2.22	.37	3843	41.8	.855	27.0	2.685	29
7845	8000	1.003	30.9	139.9	7.124	.789	.007	.039	.987	3.44	4.98	.29	4030	42.2	.871	29.9	2.948	30
7782	7906	.991	51.1	138.9	6.935	.802	.008	.040	.982	5.35	4.84	.31	4026	42.5	.873	30.0	2.939	31
7535	7804	.979	30.7	137.2	6.759	.805	.009	.037	.985	3.19	4.73	.30	4007	42.8	.886	28.8	2.938	32
7406	7522	.943	29.1	139.4	6.419	.833	.008	.038	.958	2.95	4.23	.29	3990	41.8	.871	29.7	2.968	33
7108	7840	.908	28.3	129.2	5.882	.834	.006	.041	.983	2.58	3.86	.29	3950	42.6	.853	28.8	2.955	34
6887	6772	.848	26.3	115.1	4.972	.847	.008	.039	.967	2.04	3.01	.29	3956	42.2	.836	28.5	2.903	35
6985	6383	.800	22.9	101.5	4.187	.824	.004	.042	.972	1.67	2.40	.28	3980	41.8	.836	30.0	2.973	36
5584	5652	.834	16.5	72.2	2.702	.898	.004	.051	.989	.99	1.48	.22	3801	42.4	.846	28.9	2.699	37
7829	7859	.980	17.9	188.3	6.420	.793	.007	.037	.908	1.89	2.87	.17	3940	42.0	.871	29.3	2.889	38
7407	7429	.932	17.3	128.5	6.050	.805	.006	.041	.908	1.78	2.62	.17	3924	42.4	.879	29.2	2.893	39
7178	7185	.901	16.5	122.0	5.745	.888	.004	.043	.925	1.85	2.34	.17	3931	41.7	.880	29.4	2.944	40
6826	6855	.857	15.5	111.5	4.832	.812	.004	.046	.930	1.38	1.98	.16	3921	42.1	.887	29.4	2.946	41
6011	6017	.755	11.1	81.2	3.212	.722	.003	.048	.983	.78	1.18	.13	3829	42.1	.888	27.9	2.745	42
7508	7514	.942	12.8	124.8	6.308	.905	.004	.040	.987	1.45	2.02	.12	3908	41.1	.889	29.2	2.874	43
7545	7559	.923	12.6	121.2	5.987	.796	.003	.041	.908	1.38	1.93	.12	3879	41.3	.882	29.2	2.885	44
7080	7083	.889	11.8	113.0	5.884	.788	.005	.040	.903	1.23	1.70	.12	3845	41.0	.848	28.8	2.908	45
6878	6891	.859	10.9	104.7	4.788	.800	.010	.044	.813	.99	1.43	.12	3784	41.8	.859	28.2	2.780	46
6002	6013	.754	7.2	69.4	3.045	.833	.005	.043	.844	.85	.84	.08	3454	42.0	.849	24.5	2.428	47

(a) Continued. Inlet guide vanes open.

Run	Compressor Koroloff number index, $\frac{G}{1}$ $\frac{1}{\sqrt{1-V_1}}$	Altitude exhaust pressure, P_0 lb/sq ft	Flight Mach number, M_0	Equi- valent altitude at air static tempera- ture, T_0 °K	Engine- inlet total tempera- ture, T_1 °K	Engine- inlet total pressure, P_1 lb sq ft abs	Compressor- inlet total pressure, P_2 lb sq ft abs	Compressor- outlet total tempera- ture, T_2 °K	Compressor- outlet total pressure, P_3 lb sq ft abs	Compressor- inlet total tempera- ture, T_3 °K	Compressor- outlet total pressure, P_4 lb sq ft abs	Turbine- inlet total tempera- ture, T_4 °K	Turbine- inlet total pressure, P_5 lb sq ft abs	Turbine- outlet total tempera- ture, T_5 °K	Turbine- outlet total pressure, P_6 lb sq ft abs	Tail- pipe total tempera- ture, T_7 °K	Tail- pipe total pressure, P_7 lb sq ft abs	
Exhaust-nozzle area, 2.514 sq ft																		
46	0.942	P080	0	914	505	1845	1810	865	15473	13772	1940	12630	1886	4918	1833	4140		
49	0.958	P089	0	914	508	1837	1807	849	15077	13218	1880	12478	1855	4813	1483	4034		
50	0.947	P086	0	914	508	1862	1850	846	15082	13184	1880	12416	1855	4813	1483	4034		
51	0.942	P048	0	914	508	1845	1838	814	15029	13182	1870	12473	1855	4813	1483	4034		
52	0.948	P048	0	914	508	1845	1838	814	15029	13182	1870	12473	1855	4813	1483	4034		
53	0.956	P062	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
54	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
56	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
57	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
58	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
59	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
60	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
61	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
62	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
63	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
64	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
65	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
66	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
67	0.956	P066	0	913	507	1872	1811	846	15734	13028	1850	12276	1824	4721	1484	3900		
68	0.956	P066	1.24	388	505	1183	1174	844	7894	7854	1253	7848	1458	2451	1440	2578		
69	0.956	P066	1.24	387	504	1184	1178	844	7854	7853	1253	7854	1458	2451	1440	2578		
70	0.956	P066	1.22	389	504	1186	1184	840	7849	7854	1273	7856	1476	1454	1468	1646		
71	0.956	P066	1.21	389	512	1206	1206	782	7825	7856	1287	786	1458	1458	1458	1646		
72	0.956	P066	1.23	388	500	1183	1174	841	7851	7854	1257	7854	1458	1458	1458	1646		
73	0.956	P066	1.24	388	505	1183	1174	844	7894	7854	1253	7848	1458	2451	1440	2578		
74	0.956	P066	1.24	387	504	1184	1178	844	7854	7853	1253	7854	1458	2451	1440	2578		
75	0.956	P066	1.22	389	504	1186	1184	840	7849	7854	1273	7856	1476	1454	1468	1646		
76	0.956	P066	1.21	389	512	1206	1206	782	7825	7856	1287	786	1458	1458	1458	1646		
77	0.956	P066	1.23	388	500	1183	1174	841	7851	7854	1257	7854	1458	1458	1458	1646		
78	0.956	P066	1.24	388	505	1183	1174	844	7894	7854	1253	7848	1458	2451	1440	2578		
79	0.956	P066	1.24	387	504	1184	1178	844	7854	7853	1253	7854	1458	2451	1440	2578		
80	0.956	P066	1.22	389	504	1186	1184	840	7849	7854	1273	7856	1476	1454	1468	1646		
81	0.956	P066	1.21	389	512	1206	1206	782	7825	7856	1287	786	1458	1458	1458	1646		
82	0.956	P066	1.23	388	500	1183	1174	841	7851	7854	1257	7854	1458	1458	1458	1646		
83	0.956	P066	1.24	388	505	1183	1174	844	7894	7854	1253	7848	1458	2451	1440	2578		
84	0.956	P066	1.24	387	504	1184	1178	844	7854	7853	1253	7854	1458	2451	1440	2578		
85	0.956	P066	1.22	389	504	1186	1184	840	7849	7854	1273	7856	1476	1454	1468	1646		
86	0.956	P066	1.21	389	512	1206	1206	782	7825	7856	1287	786	1458	1458	1458	1646		
87	0.956	P066	1.23	388	500	1183	1174	841	7851	7854	1257	7854	1458	1458	1458	1646		
88	0.956	P066	1.24	388	505	1183	1174	844	7894	7854	1253	7848	1458	2451	1440	2578		
89	0.956	P066	1.24	387	504	1184	1178	844	7854	7853	1253	7854	1458	2451	1440	2578		
90	0.956	P066	1.22	389	504	1186	1184	840	7849	7854	1273	7856	1476	1454	1468	1646		
91	0.956	P066	1.21	389	512	1206	1206	782	7825	7856	1287	786	1458	1458	1458	1646		
92	0.956	P066	1.23	388	500	1183	1174	841	7851	7854	1257	7854	1458	1458	1458	1646		
93	0.956	P066	1.24	388	505	1183	1174	844	7894	7854	1253	7848	1458	2451	1440	2578		
94	0.956	P066	1.24	387	504	1184	1178	844	7854	7853	1253	7854	1458	2451	1440	2578		
95	0.956	P066	1.22	389	504	1186	1184	840	7849	7854	1273	7856	1476	1454	1468	1646		
96	0.956	P066	1.21	389	512	1206	1206	782	7825	7856	1287	786	1458	1458	1458	1646		
97	0.956	P066	1.23	388	500	1183	1174	841	7851	7854	1257	7854	1458	1458	1458	1646		
98	0.956	P066	1.24	388	505	1183	1174	844	7894	7854	1253	7848	1458	2451	1440	2578		
99	0.956	P066	1.24	387	504	1184	1178	844	7854	7853	1253	7854	1458	2451	1440	2578		
100	0.956	P066	1.22	389	504	1186	1184	840	7849	7854	1273	7856	1476	1454	1468	1646		
101	0.956	P066	1.21	389	512	1206	1206	782	7825	7856	1287	786	1458	1458	1458	1646		
102	0.956	P066	1.23	388	500	1183	1174	841	7851	7854	1257	7854	1458	1458	1458	1646		
103	0.956	P066	1.24	388	505	1183	1174	844	7894	7854	1253	7848	1458	2451	1440	2578		
104	0.956	P066	1.24	387	504	1184	1178	844	7854	7853	1253	7854	1458	2451	1440	2578		
105	0.956	P066	1.22	389	504	1186	1184	840	7849	7854	1273	7856	1476	1454	1468	1646		
106	0.956	P066	1.21	389	512	1206	1206	782	7825	7856	1287	786	1458	1458	1458	1646		
107	0.956	P066	1.23	388	500	1183	1174	841	7851	7854	1257	7854	1458	1458	1458	1646		
108	0.956	P066	1.24	388	505	1183	1174	844	7894	7854	1253	7848	1458	2451	1440	2578		
109	0.956	P066	1.24	387	504	1184	1178	844	7854	7853	1253	7854	1458	2451	1440	2578		
110	0.956	P066	1.22	389	504	1186	1184	840	7849	7854	1273	7856	1476	1454	1468	1646		
111	0.956	P066	1.21	389	512	1206	1206	782	7825	7856	1287	786	1458	1458	1458	1646		
112	0.956	P066	1.23	388	500	1183	1174	841	7851	7854	1257	7854	1458	1458	1458	1646		
113	0.956	P066	1.24	388	505	1183	1174	844	7894	7854	1253	7848	1458	2451	1440	2578		
114	0.956	P066	1.24	387	504	1184	1178	844	7854	7853	1253	7854	1458	2451	1440	2578		
115	0.956	P066	1.22	389	504	1186	1184	840	7849	7854	1273	7856	1476	1454	1468	1646		
116	0.956	P066	1.21	389	512	1206	1206	782	7825	7856	1287	786	1458	1458	1458	1646		
117	0.956	P066	1.23	388	500	1183	1174	841	7851	7854	1257	7854	1458	1458	1458	1646		
118	0.956	P066	1.24	388	505	1183	1174	844	7894	7854	1253	7848	1458	2451	1440	2578		
119	0.956	P066	1.24	387	504	1184	1178	844	7854	7853	1253	7854	1458	2451	1440	2578		
120	0.956	P066	1.22	389	504	1186	1184	840	7849	7854	1273	7856	1476	1454	1468	1646		
121	0.956	P066	1.21	389	512	1206	1206	782	7825	7856	1287	786	1458	1458	1458	1646		
122	0.956</																	

4979

TABLE I. - Continued. PERFORMANCE DATA

(a) Continued. Inlet guide vanes open.

Engine speed, N , rpm	Corrected engine speed, N_c , rpm	Compressor inlet tip Mach number, M_{t1}	Engine air flow, \dot{W}_{a1} , lb/sec	Corrected air flow, \dot{W}_{a1c} , lb/sec	Compressor pressure ratio, P_2/P_1	Compressor efficiency, η_c	Compressor discharge pressure ratio, $(P_2/P_4)/P_2$	Compressor pressure loss ratio, P_3/P_2	Combustion pressure ratio, P_4/P_3	Combustion efficiency, η_b	Combustion parameter, $\frac{P_4}{P_3} \frac{T_4}{T_3}$	Combustion Reynolds number, $\frac{\rho_4 V_4 D}{\mu}$	Corrected turbine speed, N_c , rpm	Corrected turbine gas flow, \dot{W}_{g1} , lb/sec	Turbine efficiency, η_t	Corrected turbine enthalpy drop, Δh_{t1} , Btu/lb	Turbine pressure ratio, P_5/P_4	Run	
Exhaust-nose area, 2.514 sq ft																			
7946	5255	1.010	134.3	144.2	6.934	0.805	0.015	0.033	0.975	13.5	20.6	1.88	4180	45.5	0.877	30.8	3.044	45	
7790	7888	1.008	131.3	141.8	6.751	0.819	0.012	0.034	0.985	12.9	19.8	1.87	4145	45.0	0.878	30.6	3.032	46	
7417	7812	1.008	129.8	134.8	6.185	0.834	0.010	0.036	0.984	11.5	17.8	1.87	4088	43.1	0.876	30.1	2.937	50	
7408	7804	1.011	129.0	134.4	6.184	0.839	0.008	0.038	0.973	11.5	17.4	1.88	4087	42.9	0.877	30.2	2.964	51	
8685	8750	1.011	108.1	114.7	4.802	0.862	0.008	0.038	0.985	9.84	15.2	1.18	3921	42.5	0.882	26.7	2.835	52	
8670	8748	1.011	108.6	115.2	4.808	0.860	0.010	0.037	0.975	9.84	15.3	1.18	3918	42.8	0.848	26.7	2.858	53	
8480	8523	1.008	85.8	87.5	5.791	0.711	0.003	0.043	0.984	4.96	7.85	0.74	3352	42.5	0.844	21.7	2.152	54	
8488	8548	1.008	85.3	86.2	5.787	0.708	0.005	0.042	0.985	5.04	7.80	0.74	3311	41.8	0.845	21.5	2.134	55	
7941	8085	1.011	119.6	140.2	7.527	0.835	0.005	0.056	0.955	12.7	17.8	1.17	4203	41.7	0.859	31.0	3.150	56	
7939	8084	1.011	119.0	143.7	7.527	0.806	0.011	0.057	0.975	12.5	16.7	1.18	4200	42.8	0.879	31.0	3.089	57	
7794	7935	1.005	125.2	148.8	6.788	0.818	0.010	0.057	0.986	12.0	17.8	1.21	4178	42.9	0.875	31.0	3.108	58	
7692	7692	1.008	117.7	136.0	6.218	0.835	0.008	0.040	0.987	10.6	15.6	1.22	4155	42.7	0.872	31.0	3.087	59	
8699	8818	1.050	105.1	118.1	4.949	0.846	0.008	0.048	0.984	7.50	11.4	1.17	4080	43.1	0.885	30.0	3.077	60	
8473	8585	1.008	87.0	78.5	2.888	0.741	0.004	0.054	1.003	3.50	5.57	0.84	3854	43.4	0.882	27.0	2.884	61	
7947	8104	1.018	82.3	163.4	6.985	0.800	0.008	0.058	0.974	8.33	12.4	0.79	4181	43.0	0.884	31.0	3.087	62	
7790	7821	1.005	81.8	161.4	6.727	0.822	0.008	0.058	0.987	7.97	11.8	0.80	4178	42.9	0.884	31.0	3.075	63	
7618	7547	1.008	77.4	134.7	6.138	0.838	0.007	0.058	0.978	8.83	10.3	0.80	4157	42.9	0.890	31.8	3.072	64	
8678	8804	1.053	87.8	117.7	4.842	0.841	0.005	0.043	0.997	4.88	7.54	0.78	4080	43.1	0.837	30.6	3.070	65	
8630	8854	1.077	44.3	77.2	8.775	0.744	0.008	0.054	1.040	2.47	3.78	0.81	3875	43.2	0.865	27.0	2.729	66	
7948	8078	1.023	81.1	142.0	6.948	0.811	0.008	0.058	0.980	8.47	12.8	0.80	4210	42.17	0.886	31.0	3.130	67	
7796	7893	1.000	79.9	136.9	6.701	0.822	0.005	0.059	0.986	8.08	11.5	0.81	4185	42.1	0.870	31.0	3.180	68	
7613	7508	1.008	77.0	154.8	6.156	0.842	0.002	0.040	0.998	7.08	10.1	0.82	4175	42.2	0.839	31.4	3.128	69	
8676	8737	1.045	85.7	115.1	4.985	0.851	0.004	0.045	0.986	5.23	7.08	0.82	4141	40.8	0.828	31.1	3.105	70	
8438	8459	1.004	40.5	70.4	2.547	0.685	0.009	0.081	0.994	1.95	2.78	0.55	4148	42.0	0.854	29.9	3.038	71	
7615	8111	1.037	59.0	148.4	7.507	0.797	0.007	0.058	0.988	5.40	7.93	0.80	4173	42.6	0.887	30.9	3.083	72	
7945	8589	1.078	55.5	146.2	7.808	0.782	0.008	0.058	0.988	5.88	8.31	0.85	4208	42.0	0.880	30.9	3.113	73	
7788	7835	1.005	87.8	141.2	6.745	0.804	0.007	0.040	0.984	4.55	7.45	0.81	4171	42.8	0.880	31.8	3.088	74	
7686	8254	1.035	84.8	148.5	7.052	0.782	0.005	0.038	0.983	5.18	7.88	0.82	4198	42.4	0.883	30.9	3.114	75	
7408	7548	1.007	49.4	138.7	6.185	0.826	0.008	0.058	0.976	4.42	6.85	0.80	4118	43.0	0.858	30.8	3.086	76	
8847	7484	1.040	80.3	131.4	6.078	0.841	0.005	0.040	0.984	4.14	5.86	0.82	4155	41.8	0.845	30.7	3.105	77	
8870	8788	1.051	42.0	115.1	4.908	0.838	0.007	0.043	0.970	3.17	4.78	0.45	4051	42.7	0.858	30.2	3.082	78	
8436	8583	1.023	24.4	88.7	2.580	0.715	0.004	0.055	0.972	1.81	2.11	0.56	3855	41.0	0.836	29.5	2.851	79	
7948	8871	1.075	34.8	145.7	7.435	0.780	0.007	0.038	0.980	3.85	6.08	0.53	4184	42.6	0.854	30.8	3.194	80	
7613	8090	1.069	35.4	140.6	7.009	0.784	0.008	0.038	0.984	3.19	4.87	0.54	4170	42.4	0.853	30.9	3.184	81	
7941	8125	1.018	32.2	142.0	6.984	0.786	0.007	0.040	0.945	3.31	4.56	0.51	4187	42.7	0.880	31.4	3.088	82	
7796	7974	1.000	31.1	159.7	6.872	0.808	0.008	0.042	0.926	3.21	4.53	0.51	4185	41.8	0.874	31.1	3.128	83	
7590	7859	1.007	30.3	156.7	6.381	0.833	0.007	0.041	0.990	2.78	4.07	0.51	4111	42.7	0.858	30.8	3.135	84	
8938	7478	1.038	31.1	129.0	6.884	0.813	0.008	0.038	0.951	2.82	3.79	0.55	4088	42.3	0.858	30.2	3.120	85	
8887	8813	1.054	28.0	117.4	6.550	0.845	0.006	0.041	0.998	1.89	2.85	0.50	4038	42.5	0.831	30.2	3.127	86	
8504	8819	1.004	18.3	72.6	3.824	0.889	0.008	0.059	0.959	1.82	1.48	0.22	3838	42.6	0.879	27.2	2.830	87	
7962	8448	1.052	20.8	148.0	7.888	0.781	0.005	0.035	0.987	2.54	2.94	0.21	4144	29.4	0.808	30.9	3.423	88	
7963	8154	1.084	20.0	141.8	7.085	0.870	0.007	0.059	0.853	2.12	2.80	0.19	4108	43.1	0.848	30.7	3.121	89	
7627	8110	1.017	20.0	141.0	6.977	0.779	0.005	0.058	0.958	1.85	2.98	0.20	4181	42.8	0.848	30.7	3.187	90	
7771	7948	1.007	19.3	138.0	6.789	0.784	0.008	0.048	0.990	1.89	2.87	0.18	4089	43.0	0.808	30.5	3.108	91	
7584	7845	1.046	18.3	131.7	6.185	0.808	0.008	0.043	0.976	1.75	2.80	0.19	4018	43.0	0.841	30.1	3.114	92	
8080	7871	1.012	18.1	127.5	6.058	0.867	0.008	0.039	0.957	1.82	2.20	0.21	4017	40.5	0.787	30.1	3.357	93	
8544	8785	1.051	15.7	115.8	4.752	0.811	0.009	0.049	0.976	1.19	1.96	0.17	3968	43.6	0.825	29.6	3.103	94	
8538	8537	1.007	9.0	88.7	2.712	0.804	0.009	0.040	0.748	0.84	0.83	0.13	3785	39.6	0.840	29.6	3.813	95	
7961	8448	1.058	18.0	140.8	7.425	0.744	0.002	0.059	0.983	1.79	2.55	0.15	4089	42.0	0.830	30.8	3.218	96	
7648	8106	1.017	18.4	138.0	6.845	0.781	0.002	0.059	0.998	1.88	2.33	0.15	4085	42.8	0.852	30.4	3.108	97	
7968	8089	1.018	14.7	138.1	6.922	0.798	0.003	0.058	0.988	1.82	2.37	0.14	4082	42.1	0.866	30.4	3.037	98	
7864	8056	1.010	14.8	138.0	6.985	0.773	0.002	0.057	0.933	1.81	2.41	0.14	4031	42.9	0.847	30.2	3.084	99	
7442	7918	1.023	14.7	138.5	6.823	0.778	0.003	0.041	0.984	1.84	2.33	0.14	4008	43.2	0.841	30.1	3.100	100	
7454	7899	1.032	14.0	129.5	6.185	0.782	0.004	0.087	0.984	1.37	2.08	0.14	3985	43.1	0.851	30.0	3.099	101	
8968	7407	1.029	18.4	125.4	6.781	0.786	0.002	0.040	0.989	1.21	1.88	0.18	3862	43.5	0.831	29.7	3.102	102	
8534	8779	1.050	11.6	108.3	4.784	0.786	0.001	0.044	0.908	0.86	1.44	0.13	3873	42.2	0.852	29.3	3.822	103	
8112	8840	1.082	8.8	88.8	2.580	0.748	0.008	0.058	0.952	0.86	1.08	0.11	3782	43.4	0.819	27.2	3.822	104	
8798	8900	1.040	8.4	75.7	3.044	0.801	0.018	0.068	0.841	0.88	0.96	0.10	3665	43.9	0.820	26.4	3.880	105	

TABLE I. - Continued. PERFORMANCE DATA

(a) Continued. Inlet guide vanes open.

Run	Com-pressor Reynolds number index, $\frac{U}{\sqrt{P_0}}$	Altitude-exhaust pressure, P_0 , lb/sq ft	Flight Mach number, M_0	Equi-valent ambient air static temperature, T_0 , °R	Engine-inlet total temperature, T_1 , °R	Engine-inlet total pressure, P_1 , lb/sq ft abs	Compressor-inlet total pressure, P_2 , lb/sq ft abs	Compressor-outlet total temperature, T_2 , °R	Compressor-outlet total pressure, P_3 , lb/sq ft abs	Combustor-inlet total pressure, P_4 , lb/sq ft abs	Turbine-inlet total temperature, T_5 , °R	Turbine-inlet total pressure, P_5 , lb/sq ft abs	Turbine-outlet total temperature, T_6 , °R	Turbine-outlet total pressure, P_6 , lb/sq ft abs	Tail-pipe total temperature, T_7 , °R	Tail-pipe total pressure, P_7 , lb/sq ft abs
Exhaust-nozzle area, 2.694 sq ft																
106	0.938	2083	0	514	506	1933	1901	956	13079	12898	1807	12449	1445	3851	1405	3762
107	.942	2089	0	514	506	1942	1912	942	12864	12837	1750	12084	1400	3772	1388	3664
108	.942	2080	0	513	506	1944	2114	909	11740	11827	1840	11177	1504	3847	1272	3458
109	.958	2086	0	511.1	505	1976	1957	844	9805	9857	1455	9169	1161	3065	1148	3032
110	.978	2055	0	513	506	2004	1997	747	5727	5709	1580	5457	1185	2424	1140	2405
111	.988	1180	.805	445	505	1806	1771	949	12106	11994	1756	11526	1384	3458	1335	3345
112	.988	1183	.802	447	504	1805	1771	953	11897	11890	1680	11111	1334	3543	1292	3247
113	.988	1183	.805	445	505	1806	1771	949	12106	11994	1756	11526	1384	3458	1335	3345
114	.991	1188	.803	448	506	1815	1784	899	10895	10604	1550	10174	1210	3061	1194	2981
115	.990	1194	.795	450	507	1810	1800	720	4678	4533	1010	9275	791	1548	798	1562
116	.983	775	.814	445	504	1197	1172	950	7855	7805	1750	7581	1382	2983	1347	2906
117	.988	774	.813	445	504	1198	1172	935	7702	7645	1700	7331	1327	2202	1307	2135
118	.985	776	.811	445	504	1198	1177	901	7080	6998	1660	6709	1209	2011	1199	1955
119	.980	769	.815	446	505	1159	1175	834	5529	5508	1595	5244	1013	1880	1015	1852
120	.985	778	.811	448	507	1198	1192	721	3068	3048	1015	2877	786	1045	801	1029
121	.996	468	1.22	384	498	1207	1187	946	8130	8040	1775	7741	1387	2521	1366	2536
122	.991	479	1.22	384	499	1200	1181	931	7891	7827	1707	7537	1332	2244	1317	2167
123	.989	468	1.24	382	500	1195	1179	899	7834	7765	1677	7463	1216	2049	1218	1987
124	.982	477	1.23	388	505	1199	1185	829	6880	6822	1500	6549	990	1833	992	1855
125	.979	482	1.21	381	506	1188	1072	714	2996	2970	867	2788	849	860	670	835
126	.427	478	.818	382	444	487	727	891	5449	5426	1770	5217	1398	1858	1373	1506
127	.427	482	.812	382	444	490	751	855	5137	5109	1687	4902	1290	1488	1255	1416
128	.370	488	.798	447	504	758	744	982	5010	4981	1783	4774	1418	1441	1284	1395
129	.568	485	.806	439	497	748	736	928	4906	4885	1685	4675	1340	1311	1297	1292
130	.370	503	.795	448	504	761	748	958	4845	4816	1703	4613	1344	1394	1309	1348
131	.371	495	.803	440	497	757	751	897	4514	4480	1570	4284	1232	1301	1207	1284
132	.370	498	.798	447	504	757	745	905	4448	4408	1578	4252	1228	1289	1213	1274
133	.428	480	.815	391	445	485	751	792	4368	4334	1589	4165	1089	1246	1087	1204
134	.378	502	.806	441	498	789	761	826	3568	3535	1584	3340	1016	1058	1018	1015
135	.370	501	.794	446	500	789	757	718	1956	1928	1010	1880	788	674	800	964
136	.267	298	.828	390	445	487	459	892	3398	3377	1790	3254	1417	975	1388	940
137	.269	308	.819	391	445	475	468	857	3210	3195	1685	3064	1312	980	1278	889
138	.267	298	.828	391	444	486	459	848	3141	3129	1615	2996	1273	897	1248	886
139	.229	307	.809	441	499	472	468	950	3112	3094	1783	2981	1408	897	1390	889
140	.230	314	.795	444	500	478	472	951	3128	3111	1800	2978	1409	903	1398	878
141	.227	302	.813	441	499	486	481	858	3039	3020	1780	2895	1283	870	1356	844
142	.227	308	.808	445	500	470	466	852	3000	2982	1730	2849	1256	864	1339	837
143	.223	301	.806	445	500	461	456	808	2737	2737	1820	2627	1261	789	1254	766
144	.267	301	.809	392	445	483	487	796	2754	2722	1415	2606	1096	778	1065	750
145	.226	309	.794	444	500	468	464	835	2178	2159	1355	2059	1040	629	1046	615
146	.229	380	.778	449	505	477	477	727	1804	1798	1080	1735	845	427	839	415
147	.132	179	.815	439	497	768	768	942	1845	1830	1860	1850	1505	348	1442	831
148	.148	188	.795	441	497	285	274	942	1882	1860	1767	1782	1492	529	1368	513
149	.138	195	.788	443	498	293	283	912	1769	1749	1847	1872	1319	502	1274	487
150	.138	188	.777	444	498	296	289	895	1501	1494	1827	1833	1044	379	1021	366
151	.135	199	.777	445	499	286	285	757	851	845	1175	804	813	270	922	286
152	.105	193	.768	495	496	214	207	968	1445	1442	1826	1370	1582	421	1508	408
153	.125	193	.750	479	497	219	212	944	1420	1397	1837	1340	1464	420	1452	386
154	.119	200	.742	481	498	226	219	913	1501	1489	1897	1327	1368	385	1324	373
155	.112	204	.748	478	499	258	235	886	1277	1211	1433	1161	1290	387	1197	367
156	.110	202	.770	487	500	222	219	819	913	908	1410	887	1153	300	1121	293

TABLE I. - Continued. PERFORMANCE DATA

(a) Continued. Inlet guide vanes open.

Engine speed, N , rpm	Corrected engine speed, $\frac{N}{\sqrt{\theta_1}}$, rpm	Compressor inlet tip Mach number, M_1	Engine air flow, \dot{W}_a , lb/sec	Corrected air flow, $\dot{W}_a \sqrt{\frac{\theta_1}{\theta_5}}$, lb/sec	Compressor pressure ratio, P_2/P_1	Compressor efficiency, η_c	Compressor discharge pressure loss ratio, $(P_3-P_4)/P_2$	Combustor pressure loss ratio, P_4/P_3	Combustion efficiency, η_b	Combustion parameter, $P_4/P_3 \sqrt{\frac{\theta_1}{\theta_5}}$	Combustion parameter, $\frac{\dot{W}_a}{\sqrt{\theta_5}}$, 10^{-4}	Turbine Reynolds number, Re , $\frac{N}{\sqrt{\theta_5}}$	Corrected turbine speed, $\frac{N}{\sqrt{\theta_5}}$, rpm	Corrected turbine gas flow, $\dot{W}_a \sqrt{\frac{\theta_1}{\theta_5}}$, lb/sec	Turbine efficiency, η_t	Corrected turbine enthalpy drop, $\Delta h_0 \sqrt{\frac{\theta_1}{\theta_5}}$, Btu/lb-sec	Turbine pressure ratio, P_8/P_5	Run
Exhaust-nose area, 2.694 sq ft																		
7955	8065	1.011	135.2	143.9	6.785	0.804	0.014	0.035	0.963	12.6	18.7	1.51	4314	42.8	0.879	32.3	3.233	106
7788	7888	.990	131.7	141.8	6.521	.810	.010	.036	.969	12.1	17.9	1.54	4289	42.8	.880	32.8	3.204	107
7420	7522	.943	126.8	134.8	6.039	.852	.001	.039	.959	10.9	16.0	1.55	4220	42.8	.864	32.0	3.152	108
6588	6778	.850	100.9	115.0	4.881	.848	.006	.041	.962	8.49	12.5	1.25	4054	42.2	.851	30.1	2.974	109
5488	5588	.698	68.1	71.1	2.658	.733	.003	.044	.968	4.84	7.78	.81	3466	42.6	.841	28.9	2.281	110
7953	8078	1.015	124.8	144.1	6.705	.804	.006	.039	.941	11.7	18.6	1.29	4399	42.3	.885	33.0	3.333	111
7786	7901	.991	122.8	141.8	6.480	.821	.008	.041	.957	11.1	18.9	1.29	4373	42.4	.877	33.0	3.323	112
7415	7525	.944	117.7	135.8	5.802	.835	.009	.041	.973	9.67	14.1	1.30	4352	42.8	.859	33.0	3.323	113
6578	6783	.848	101.0	116.2	4.848	.848	.008	.046	.968	7.04	10.2	1.22	4229	42.5	.884	32.0	3.268	114
5411	5475	.687	63.9	75.6	2.529	.722	.008	.057	1.016	3.29	5.09	.80	3515	43.6	.870	27.0	2.710	115
7540	8057	1.017	82.5	145.7	6.848	.802	.008	.041	.972	7.67	11.1	.84	4378	42.7	.890	33.0	3.521	116
7795	7910	.992	80.8	141.1	6.445	.814	.007	.041	.982	7.32	10.6	.84	4354	42.6	.877	33.0	3.529	117
7412	7521	.945	77.2	134.7	5.900	.832	.008	.041	.971	6.42	9.25	.88	4318	42.4	.885	33.0	3.537	118
6574	6786	.848	65.7	117.8	4.850	.848	.004	.048	1.006	4.60	6.77	.80	4213	42.9	.851	31.0	3.319	119
5443	5508	.691	48.3	75.9	2.561	.725	.007	.058	1.008	2.22	3.39	.80	3829	43.2	.853	28.0	2.753	120
7955	8121	1.018	82.9	142.4	6.787	.871	.006	.042	.984	7.97	11.5	.85	4352	42.4	.878	33.0	3.328	121
7784	7948	.997	82.3	142.2	6.576	.815	.001	.044	.990	7.84	10.8	.88	4348	42.3	.855	32.9	3.369	122
7441	7581	.951	78.4	138.2	5.064	.836	.010	.042	.981	6.53	9.33	.88	4313	42.4	.856	32.9	3.349	123
6888	6791	.852	67.7	117.7	4.712	.855	.005	.048	.982	4.73	6.71	.85	4255	41.7	.859	32.4	3.380	124
5470	5540	.685	43.1	75.8	2.522	.755	.009	.052	.995	2.07	2.84	.78	4255	41.7	.850	30.9	3.239	125
7984	8511	1.080	84.8	144.8	7.564	.758	.004	.038	.984	5.44	7.52	.57	4351	41.5	.858	32.7	3.349	126
7819	8258	1.033	84.1	142.4	6.914	.781	.008	.040	.987	4.89	6.78	.59	4346	41.8	.861	32.6	3.339	127
7953	8071	1.012	81.7	142.5	6.508	.798	.008	.042	.984	4.85	6.62	.59	4353	42.5	.865	33.0	3.315	128
7784	7884	.999	80.8	140.9	6.575	.814	.008	.039	.941	4.72	6.56	.84	4372	41.8	.834	33.2	3.365	129
7792	7907	.992	80.8	138.7	6.564	.822	.008	.041	.997	4.63	2.56	.83	4347	42.6	.854	33.0	3.309	130
7420	7562	.951	68.7	133.3	5.953	.820	.008	.044	.953	4.17	5.28	.54	4306	42.1	.873	33.0	3.393	131
7400	7510	.948	68.4	133.3	5.888	.818	.008	.040	.960	4.06	2.50	.55	4292	42.4	.854	33.0	3.381	132
6920	7501	.941	50.5	133.4	5.098	.838	.007	.039	.972	3.76	6.38	.50	4269	42.1	.859	32.9	3.349	133
6889	6809	.854	63.4	117.1	4.537	.831	.004	.049	1.008	2.94	4.43	.51	4207	43.4	.861	31.9	3.283	134
5488	5530	.693	24.9	88.1	2.651	.707	.006	.055	.965	1.51	1.99	.58	3928	40.1	.868	27.8	2.701	135
7984	8620	1.061	84.8	145.7	7.270	.748	.005	.042	.985	3.82	4.83	.58	4338	42.8	.865	32.4	3.393	136
7814	8241	1.033	84.3	141.2	6.788	.775	.005	.041	.962	3.01	4.38	.54	4313	42.6	.860	32.4	3.350	137
7506	8115	1.019	83.9	142.4	6.740	.785	.008	.042	.981	2.92	4.23	.58	4301	42.5	.881	32.7	3.339	138
7950	8087	1.014	81.6	138.8	6.593	.782	.006	.045	.973	3.06	4.42	.58	4317	42.7	.863	32.7	3.301	139
7908	8054	1.010	81.5	137.4	6.571	.782	.006	.045	.979	3.11	4.40	.58	4294	42.2	.889	32.8	3.296	140
7785	7948	.997	81.6	140.7	6.521	.797	.008	.041	.985	2.92	4.29	.58	4293	42.8	.861	32.6	3.328	141
7775	7922	.993	81.3	138.4	6.353	.801	.006	.045	.958	2.87	4.19	.58	4308	42.9	.889	32.4	3.297	142
7420	7550	.948	69.3	132.0	5.899	.826	.008	.040	.977	2.89	3.67	.52	4292	42.0	.855	32.1	3.350	143
6924	7494	.940	31.2	131.6	5.806	.825	.004	.043	.969	2.40	3.41	.37	4237	41.8	.839	32.1	3.346	144
6874	6800	.853	26.7	113.8	4.850	.821	.003	.051	.990	1.85	2.89	.31	4183	42.8	.845	31.7	3.273	145
5472	5558	.697	17.4	75.8	2.594	.578	.007	.034	.877	.83	1.45	.23	3587	48.0	.885	27.4	2.656	146
7970	8144	1.088	19.1	142.4	7.022	.785	.005	.014	.955	1.89	2.75	.19	4292	41.8	.881	33.0	3.368	147
7771	7941	.995	19.0	137.7	6.804	.781	.001	.032	.919	1.88	2.69	.19	4269	42.0	.883	33.0	3.368	148
7449	7806	.964	18.3	129.7	6.014	.787	.007	.044	.920	1.89	2.33	.20	4227	41.7	.857	32.0	3.331	149
6847	6894	.858	14.8	104.2	4.410	.800	.005	.047	.888	1.14	1.51	.18	4124	40.7	.858	31.0	3.263	150
5706	5900	.740	10.5	75.8	2.976	.704	.009	.046	.695	.89	.98	.14	3899	41.3	.858	29.0	2.978	151
7938	8104	1.016	14.3	138.8	6.782	.780	.002	.050	.935	1.47	2.15	.19	4178	42.4	.882	32.0	3.254	152
7714	7883	.989	14.1	135.1	6.597	.785	.003	.041	.916	1.41	2.02	.19	4149	41.8	.883	32.0	3.277	153
7389	7563	.943	13.8	128.9	5.787	.771	.009	.040	.955	1.21	1.83	.19	4118	43.2	.857	31.0	3.213	154
6915	7060	.886	13.5	119.8	5.113	.783	.006	.041	.928	1.08	1.88	.21	4202	42.4	.837	32.0	3.184	155
6348	6488	.811	10.5	98.3	4.113	.776	.008	.043	.872	.79	1.16	.12	3885	43.5	.848	29.0	2.690	156

TABLE I. - Continued. PERFORMANCE DATA

(a) Continued. Inlet guide vanes open.

Run	Com- pressor Reynolds number index, $\frac{\delta_1}{1\sqrt{\theta_1}}$	Altitude- exhaust pressure, P_0 , lb/sq ft	Flight Mach number, M_0	Equiv- alent ambient- air static tempera- ture, T_0 , $^{\circ}R$	Engine- inlet total tempera- ture, T_1 , $^{\circ}R$	Engine- inlet total pressure, P_1 , lb sq ft abs	Compressor- inlet total pressure, P_2 , lb sq ft abs	Compressor- outlet total tempera- ture, T_3 , $^{\circ}R$	Compressor- outlet total pressure, P_3 , lb sq ft abs	Compressor- outlet total pressure, P_3 , lb sq ft abs	Combus- tor- inlet total pressure, P_4 , lb sq ft abs	Turbine- inlet total tempera- ture, T_5 , $^{\circ}R$	Turbine- inlet total pressure, P_5 , lb sq ft abs	Turbine- outlet total tempera- ture, T_6 , $^{\circ}R$	Turbine- outlet total pressure, P_6 , lb sq ft abs	Tail- pipe total tempera- ture, T_7 , $^{\circ}R$	Tail- pipe total pressure, P_7 , lb sq ft abs
Exhaust-nozzle area, 3.588 sq ft																	
157	1.051	2053	0	512	503	1933	1891	938	12378	12287	1573	11775	1193	3171	1174	2888	
158	.841	2051	0	511	503	1937	1911	923	11852	11750	1525	11274	1145	2989	1138	2750	
159	.959	2060	0	509	501	1957	1935	891	10892	10684	1427	10448	1062	2825	1054	2664	
160	.970	2057	0	506	501	1976	1958	827	8010	8974	1280	8533	958	2514	945	2447	
161	1.000	2057	0	502	500	2024	2017	734	5648	5615	1223	5352	1016	2239	999	2221	
162	.992	2057	0	504	502	2025	2017	735	5628	5602	1223	5335	1019	2235	998	2215	
163	.988	2051	0	505	504	2037	2035	666	3974	3984	1283	3794	1128	2150	1114	2140	
164	.899	1191	.793	442	487	1802	1772	927	11491	11418	1550	10933	1171	2821	1158	2418	
165	.899	1190	.795	441	487	1804	1776	914	11181	11121	1500	10651	1150	2753	1120	2380	
166	.892	1178	.812	442	500	1816	1793	883	10370	10500	1385	9859	1031	2544	1026	2178	
167	.920	1255	.786	450	505	1888	2049	887	9537	9568	1385	9158	1050	2581	1026	2213	
168	.880	1201	.792	451	507	1815	1797	827	8001	7889	1170	7631	851	1942	853	1756	
169	.911	1183	.798	438	484	1815	1807	705	5058	5027	863	4721	841	1432	849	1392	
170	.855	784	.803	415	488	1213	1184	895	7845	7884	1557	7570	1181	1837	1167	1894	
171	.847	788	.802	418	489	1205	1185	884	7730	7881	1503	7548	1133	1904	1122	1834	
172	.835	786	.800	421	475	1198	1181	855	7032	8886	1373	8677	1028	1723	1022	1478	
173	.807	786	.800	433	488	1197	1185	797	5529	5515	1153	5228	849	1349	852	1221	
174	.802	786	.800	440	498	1213	1209	691	2852	2852	887	2881	887	908	873	891	
175	.594	484	1.232	383	439	1208	1195	813	5405	5381	1180	5087	853	1314	854	1180	
176	.585	483	1.239	384	502	1205	1192	813	5319	5289	1158	5009	850	1283	853	1091	
177	.579	492	1.223	389	508	1201	1194	744	3897	3866	975	3444	826	879	840	780	
178	.429	487	.807	385	446	747	732	881	5198	5162	1585	4943	1208	1274	1193	1093	
179	.431	491	.804	398	448	751	735	882	5041	5014	1520	4799	1152	1238	1139	1062	
180	.432	492	.804	395	448	753	738	828	4892	4861	1325	4461	1036	1141	1031	979	
181	.437	489	.812	390	442	754	741	762	3813	3896	1177	3710	864	847	866	821	
182	.454	491	.804	391	442	751	747	654	3568	3553	830	2206	612	821	821	899	
183	.258	293	.821	396	449	458	435	---	---	---	---	---	1216	774	1201	684	
184	.278	332	.780	406	485	498	468	---	---	---	---	---	1217	814	1202	704	
185	.278	333	.777	405	484	498	490	---	---	---	---	---	1171	784	1158	677	
186	.278	333	.781	405	454	498	492	---	---	---	---	---	1082	758	1058	635	
187	.288	304	.802	394	445	484	441	---	---	---	---	---	877	576	879	508	
188	.288	291	.830	386	439	487	447	---	---	---	---	---	841	401	850	386	
189	.188	254	.705	703	488	354	349	---	---	---	---	---	1293	544	1273	477	
190	.189	249	.719	728	489	351	348	---	---	---	---	---	1230	525	1212	481	
191	.189	250	.719	720	470	348	346	---	---	---	---	---	1121	482	1109	425	
192	.189	255	.893	708	472	352	349	---	---	---	---	---	905	405	903	372	
193	.189	249	.719	722	472	348	346	---	---	---	---	---	793	453	797	411	
194	.168	259	.599	417	487	288	289	---	---	---	---	---	1385	425	1329	383	
195	.185	254	.588	404	485	282	280	---	---	---	---	---	1232	401	1214	367	
196	.153	254	.577	403	484	280	278	---	---	---	---	---	1088	382	1068	333	
197	.152	253	.581	398	483	280	278	---	---	---	---	---	889	318	924	306	

TABLE I. - Continued. PERFORMANCE DATA

(a) Concluded. Inlet guide vanes open.

Engine speed, N, rpm	Corrected engine speed, $\frac{N}{\sqrt{\theta_1}}$, rpm	Compressor inlet tip Mach number, M_0	Engine air flow, $\dot{W}_{a,1}$, lb/sec	Corrected air flow, $\dot{W}_{a,1} \sqrt{\frac{\theta_1}{\theta_5}}$, lb/sec	Compressor pressure ratio, P_3/P_1	Compressor efficiency, η_c	Compressor discharge pressure-loss ratio, $(P_3-P_4)/P_5$	Combustor pressure-loss ratio, $\frac{P_4-P_5}{P_4}$	Combustion efficiency, η_b	Combustion parameter, $\frac{P_4 T_5}{V_b}$, 10^{-4}	Combustion parameter, $\frac{W_{a,1} T_5}{10^{-4}}$	Turbine Reynolds number index, $\frac{N}{\sqrt{\theta_5}}$	Corrected turbine speed, $\frac{N}{\sqrt{\theta_5}}$, rpm	Corrected turbine gas flow, $\dot{W}_{g,5} \sqrt{\frac{\theta_5}{\theta_8}}$, lb/sec	Turbine efficiency, η_t	Corrected turbine enthalpy drop, $\Delta h_t/\theta_5$, Btu/lb-sec	Turbine pressure ratio, P_8/P_5	Run
Exhaust-nozzle area, 3.688 sq ft																		
7948	8074	1.012	133.8	144.2	6.404	0.800	0.008	0.040	0.888	11.4	15.7	1.46	4610	42.1	0.680	35.9	3.713	157
7778	7900	.991	131.7	141.6	6.118	.802	.009	.041	.888	10.6	15.0	1.46	4586	42.5	.680	35.8	3.786	158
7411	7543	.948	127.4	135.3	5.817	.815	.010	.040	.888	9.41	13.6	1.44	4513	42.8	.674	35.3	3.887	159
8887	8768	.851	110.4	118.1	4.580	.830	.004	.048	.887	7.38	10.4	1.40	4307	42.7	.693	33.4	3.384	160
5489	5592	.701	70.7	72.8	2.790	.725	.005	.047	.883	4.81	7.06	.90	3399	43.0	.678	24.8	2.391	161
5492	5584	.700	72.5	73.8	2.779	.729	.008	.048	.879	4.44	7.14	.80	3801	43.6	.683	24.4	2.387	162
4383	4861	.584	46.2	49.4	1.951	.584	.005	.043	.881	3.50	5.37	.62	2985	42.1	.633	18.4	1.783	163
7926	8099	1.018	128.2	145.0	8.377	.798	.007	.042	.931	10.4	14.6	1.39	4627	42.4	.652	36.0	3.876	164
7780	7960	.998	124.3	142.7	8.203	.808	.007	.042	.985	10.1	13.8	1.41	4525	42.1	.652	36.0	3.888	165
7424	7564	.949	118.8	136.7	5.710	.836	.007	.043	.988	8.97	12.3	1.44	4582	41.9	.659	35.8	3.878	166
7411	7513	.942	122.7	136.0	5.112	.778	.007	.045	.995	7.56	12.8	1.33	4580	46.4	.912	35.7	3.841	167
8701	8780	.850	102.4	118.0	4.408	.829	.004	.055	1.001	6.26	8.75	1.34	4819	43.1	.877	35.7	3.877	168
5504	5642	.708	75.8	84.1	2.787	.786	.008	.061	1.000	3.48	4.79	1.18	4290	42.1	.671	31.4	3.297	169
7926	8347	1.047	88.0	147.4	8.550	.773	.008	.040	.998	6.82	10.4	.96	4619	43.3	.852	36	3.837	170
7797	8202	1.029	86.2	144.2	8.428	.768	.008	.043	.974	6.79	9.88	.98	4825	42.4	.854	38	3.860	171
7407	7742	.971	83.0	140.3	5.870	.817	.009	.049	.984	5.78	8.49	.97	4582	42.8	.848	35	3.874	172
6853	8881	.880	70.7	121.2	4.819	.863	.003	.052	.977	4.25	6.03	.95	4520	42.5	.844	36	3.878	173
5328	5450	.683	42.2	72.0	2.351	.702	.007	.060	.986	1.89	2.84	.88	4143	42.8	.858	29	2.831	174
6887	8819	.885	88.8	118.2	4.473	.864	.004	.065	1.032	4.25	5.89	.91	4530	42.6	.850	35.3	3.871	175
6853	8755	.848	87.8	118.5	4.414	.848	.004	.065	.994	4.21	5.75	.90	4511	42.5	.849	35.0	3.905	176
5843	5918	.742	52.4	91.2	3.078	.802	.008	.081	.913	2.80	3.35	.84	4522	41.3	.845	38.0	3.818	177
7858	8583	1.076	55.7	148.3	8.958	.754	.007	.042	.990	4.84	6.65	.82	4598	41.9	.838	36	3.880	178
7796	8409	1.064	55.5	145.0	8.712	.789	.006	.043	.988	4.58	6.32	.82	4598	42.1	.842	38	3.876	179
7420	8004	1.004	54.3	141.8	8.281	.797	.007	.043	.991	4.05	5.80	.85	4583	42.1	.848	36	3.909	180
8888	7245	.808	49.7	128.7	6.190	.827	.004	.048	1.004	3.09	4.50	.66	4498	42.8	.851	35.4	3.817	181
5492	6981	.745	35.0	90.9	3.183	.811	.006	.082	.968	1.80	2.17	.58	4392	41.8	.859	32.7	3.556	182
7918	8084	1.075	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	183
7958	8499	1.068	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	184
7778	8314	1.045	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	185
7384	7885	.980	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	186
8885	7219	.905	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	187
5598	8087	.785	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	188
7958	8380	1.031	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	189
7788	8191	1.027	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	190
7386	7782	.973	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	191
8870	8998	.877	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	192
6792	8558	.822	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	193
8006	8440	1.058	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	194
7840	8071	1.012	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	195
7187	7812	.955	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	196
8508	8888	.864	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	197

TABLE I. - Continued. PERFORMANCE DATA

(b) Inlet guide vanes closed.

Run	Com- pressor Reynolds number index, $\frac{S_1}{1-\sqrt{S_1}}$	Altitude- exhaust pressure, P_0 , lb/sq ft	Flight Mach number, M_0	Equiv- alent ambient air static tempera- ture, t_0 , $^{\circ}R$	Engine- inlet total tempera- ture, T_1 , $^{\circ}R$	Engine- inlet total pressure, P_1 , lb sq ft abs	Compressor- inlet total pressure, P_2 , lb sq ft abs	Compressor- outlet total tempera- ture, T_3 , $^{\circ}R$	Compressor- outlet total pressure, P_3 , lb sq ft abs	Combustor- inlet total pressure, P_4 , lb sq ft abs	Turbine- inlet total tempera- ture, T_5 , $^{\circ}R$	Turbine- inlet total pressure, P_5 , lb sq ft abs	Turbine- outlet total tempera- ture, T_6 , $^{\circ}R$	Turbine- outlet total pressure, P_6 , lb sq ft abs	Tail- pipe total tempera- ture, T_7 , $^{\circ}R$	Tail- pipe total pressure, P_7 , lb sq ft abs
Exhaust-nose area, 2.588 sq ft																
1	0.950	2046	0	521	517	1997	1988	845	8285	8226	1507	7892	1262	2972	1246	2899
2	.949	2038	0	521	518	2000	1993	772	8555	8555	1340	8283	1114	2632	1108	2688
3	.949	2045	0	522	520	2020	2018	702	4848	4842	1240	4818	1102	2380	1070	2357
4	.950	2038	0	521	520	2028	2028	658	3527	3516	1283	3379	1151	2212	1133	2202
5	.951	2034	0	520	519	2027	2027	614	3135	3111	1283	3023	1184	2161	1170	2153
6	.881	1154	0.821	449	509	1811	1801	822	7187	7079	1347	6789	1054	2285	1056	2228
7	.881	1168	.813	450	509	1800	1792	783	6555	6584	1203	6015	958	2043	858	2000
8	.880	1153	.819	450	510	1789	1782	707	4864	4542	987	4275	785	1838	789	1597
9	.882	800	.796	458	514	759	785	837	3069	3033	1400	2912	1098	984	1102	958
10	.882	489	.794	455	512	750	748	783	2675	2887	1243	2553	978	868	872	843
11	.862	488	.803	435	514	757	754	754	2294	2281	1107	2180	875	768	873	752
12	.880	497	.797	455	513	758	753	712	1879	1873	990	1768	788	688	793	873
Exhaust-nose area, 2.514 sq ft																
13	0.948	2058	0	521	517	1995	1981	907	9295	9225	1787	8858	1432	3182	1421	3088
14	.950	2069	0	521	517	2000	2199	894	9147	9070	1727	8708	1387	3158	1385	3058
15	.952	2061	0	521	517	2005	1990	885	8591	8549	1820	8306	1308	3045	1304	2988
16	.953	2058	0	521	517	2008	1998	814	7717	7698	1450	7384	1182	2840	1185	2788
17	.963	2051	0	519	517	2027	2022	701	4901	4893	1250	4852	1105	2558	1078	2371
18	.400	491	0.802	418	472	750	745	858	3805	3587	1615	3436	1280	1104	1285	1073
19	.399	494	.802	420	474	754	749	845	3523	3504	1850	3359	1230	1079	1221	1050
20	.398	494	.800	423	477	753	748	814	3285	3264	1430	3129	1122	1010	1122	984
21	.387	498	.800	429	484	758	751	772	2805	2895	1243	2764	978	914	972	894
22	.378	498	.788	439	485	757	755	670	1757	1726	817	1623	738	681	742	638
Exhaust-nose area, 2.694 sq ft																
23	0.432	488	0.808	394	448	751	748	829	3644	3817	1515	3465	1182	1045	1170	1012
24	.432	499	.793	398	448	755	750	810	3511	3483	1450	3338	1129	1007	1119	973
25	.432	485	.796	398	446	751	746	778	3423	3402	1334	3281	1027	985	1025	934
26	.432	489	.790	398	446	758	749	721	2911	2900	1147	2781	872	882	878	839
27	.419	481	.804	398	447	738	734	647	2174	2172	910	2048	704	706	711	690
Exhaust-nose area, 3.686 sq ft																
28	0.954	2073	0	522	518	2021	2005	988	8806	8541	1455	8166	1138	2478	1120	2409
29	.980	2080	0	521	517	2027	2012	872	8480	8413	1420	8051	1106	2454	1089	2388
30	.989	2074	0	520	518	2022	2008	844	8092	8035	1340	7878	1049	2418	1035	2370
31	.984	2077	0	518	515	2030	2020	788	7273	7244	1240	6897	980	2387	968	2322
32	.972	2070	0	518	514	2038	2032	733	5825	5813	1150	5510	951	2280	941	2233
33	.407	487	0.808	412	468	749	742	854	3541	3315	1533	3158	990	798	988	723
34	.399	482	.815	415	470	748	740	820	3250	3232	1280	3063	944	771	943	704
35	.418	483	.815	405	457	747	742	775	3103	3080	1180	2944	850	742	850	685
36	.408	491	.812	413	487	757	753	724	2632	2621	870	2477	711	657	717	627
37	.408	484	.808	414	488	759	754	726	2643	2638	870	2487	708	659	715	630
38	.407	489	.813	412	487	755	751	658	2286	2257	857	2123	641	607	648	587

TABLE I. - Concluded. PERFORMANCE DATA

(b) Concluded. Inlet guide vanes closed.

Engine speed, N, rpm	Corrected engine speed, $\frac{N}{\sqrt{\theta_1}}$ rpm	Compressor inlet tip Mach number, M_0	Engine air flow, $W_{a,1}$, lb/sec	Corrected air flow, $W_{a,1} \sqrt{\frac{\theta_1}{\theta_5}}$, lb/sec	Compressor pressure ratio, P_3/P_1	Compressor efficiency, η_c	Compressor discharge pressure-loss ratio, $(P_3-P_4)/P_3$	Combustor pressure-loss ratio, $\frac{P_4-P_5}{P_4}$	Combustion efficiency, η_b	Combustion parameter, $\frac{P_4 P_5}{P_b} \times 10^{-4}$	Combustion parameter, $\frac{P_4 P_5}{P_b} \times 10^{-4}$	Turbine Reynolds number index, $\frac{W_{a,1} T_3}{\theta_5 \sqrt{\theta_5}}$	Corrected turbine speed, $\frac{N}{\sqrt{\theta_5}}$ rpm	Corrected turbine gas flow, $W_{g,5} \sqrt{\frac{\theta_5}{\theta_8}}$, lb/sec	Turbine efficiency, η_t	Corrected turbine enthalpy drop, $\Delta H_t/\theta_8$, Btu/lb-sec	Turbine pressure ratio, P_8/P_5	Run
Exhaust-nozzle area, 2.388 sq ft																		
7091	7104	0.891	91.7	97.0	4.149	0.785	0.007	0.041	0.980	7.47	11.4	1.02	4201	42.1	0.777	28.1	2.555	1
8019	8025	.738	77.4	81.8	3.288	.822	.003	.045	.868	5.82	8.88	.84	3212	42.0	.846	24.8	2.580	2
8016	8010	.828	89.8	82.4	2.400	.813	.001	.047	1.012	3.89	6.36	.78	3285	42.2	.848	19.0	1.858	3
4081	4077	.511	40.3	42.1	1.738	.784	.003	.039	.930	3.10	4.58	.82	2659	39.4	.868	14.4	1.528	4
5804	5804	.452	33.6	35.0	1.547	.726	.006	.028	.818	2.82	3.92	.60	2357	35.4	.783	9.8	1.589	5
7083	7152	.897	84.9	98.3	3.952	.778	.011	.040	.980	8.97	8.98	1.01	4474	42.8	.863	30.7	2.975	6
6538	6602	.828	78.7	81.7	3.531	.802	.006	.049	.986	5.14	7.36	1.03	4358	42.1	.868	29.8	2.944	7
5502	5550	.898	84.2	75.3	2.881	.791	.006	.059	.980	3.25	4.91	.85	4084	42.9	.875	26.2	2.815	8
7087	7121	.893	35.3	97.8	4.030	.772	.008	.040	.984	2.84	3.88	.42	4552	42.1	.887	30.4	2.959	9
6540	6585	.826	33.2	92.9	3.587	.792	.003	.080	.981	2.17	3.22	.42	4291	42.9	.889	29.7	2.927	10
5985	6014	.754	29.8	82.8	3.050	.795	.006	.063	1.008	1.77	2.60	.41	4145	42.4	.858	28.5	2.809	11
5447	5479	.887	26.8	71.0	2.489	.753	.003	.067	.933	1.39	2.08	.38	3979	41.8	.866	28.1	2.583	12
Exhaust-nozzle area, 2.514 sq ft																		
7945	7960	0.998	94.8	100.4	4.658	0.725	0.008	0.040	0.974	9.08	13.5	0.98	4354	42.3	0.860	28.6	2.801	13
7782	7797	.978	94.3	99.8	4.574	.740	.006	.040	.978	8.82	13.1	.98	4314	42.2	.878	28.5	2.777	14
7418	7429	.932	93.2	98.2	4.333	.768	.005	.040	.988	8.02	12.2	1.00	4240	42.3	.863	27.8	2.728	15
6670	6683	.838	87.5	92.1	3.843	.810	.003	.041	.984	6.85	10.4	1.02	4024	42.1	.832	28.2	2.600	16
5032	5042	.632	57.5	59.9	2.418	.804	.002	.049	1.048	4.21	6.20	.78	3293	40.7	.844	19.3	1.948	17
7945	8332	1.045	36.4	103.4	4.807	.689	.005	.042	.980	3.39	4.68	.42	4550	42.1	.880	30.9	3.112	18
7797	8188	1.023	38.5	103.2	4.672	.706	.004	.027	.993	3.23	4.70	.43	4553	42.9	.832	30.7	4.880	19
7413	7734	.870	37.1	99.9	4.383	.737	.008	.041	.975	2.91	4.18	.44	4807	41.7	.842	30.3	3.098	20
6735	6974	.878	35.8	98.2	3.840	.783	.003	.048	.987	2.89	3.48	.45	4384	42.2	.848	29.6	3.024	21
6148	5289	.681	24.0	66.8	2.295	.753	.007	.062	.884	1.25	1.78	.38	3898	41.2	.848	24.7	2.493	22
Exhaust-nozzle area, 2.694 sq ft																		
7848	8576	1.078	38.5	105.2	4.832	.681	.007	.042	.977	3.35	4.82	.43	4693	41.4	.855	32.8	3.318	23
7780	8393	1.082	39.0	101.4	4.850	.674	.008	.042	.985	3.15	4.37	.48	4705	41.5	.849	32.3	3.315	24
7409	7992	1.002	40.2	105.0	4.558	.732	.008	.042	.979	2.91	4.12	.81	4659	41.8	.838	31.8	3.380	25
6870	7195	.902	37.0	98.3	3.888	.783	.004	.048	.992	2.30	3.24	.80	4844	42.0	.869	31.1	3.205	26
5532	5961	.748	30.7	81.8	2.954	.789	.001	.072	.948	1.58	2.18	.48	4207	42.6	-----	28.3	2.288	27
Exhaust-nozzle area, 3.688 sq ft																		
7945	7951	0.897	88.4	102.9	4.258	0.715	0.007	0.044	1.002	7.51	11.0	1.12	4787	42.8	0.857	32.7	3.299	28
7777	7792	.877	88.0	102.1	4.174	.727	.008	.043	.986	7.31	10.7	1.13	4743	42.7	.870	32.3	3.281	29
4403	7425	.831	88.2	100.3	4.002	.780	.007	.044	.995	6.79	9.95	1.14	4638	42.6	.861	31.6	3.176	30
8883	6689	.839	90.2	82.6	3.585	.797	.004	.048	.977	5.89	8.73	1.13	4340	42.8	.875	29.3	2.927	31
5723	5751	.721	75.5	77.8	2.857	.817	.002	.082	.983	4.54	7.09	1.00	3893	42.9	.847	24.7	2.438	32
7984	8404	1.064	39.5	106.1	4.451	.672	.008	.047	.979	2.83	3.87	.48	5053	42.3	.846	36.3	3.967	33
7793	8189	1.027	39.0	105.3	4.362	.698	.008	.048	.985	2.71	3.87	.48	5041	42.1	.848	35.8	3.888	34
7424	7912	.992	39.0	103.6	4.154	.718	.007	.044	.966	2.48	3.31	.63	5030	41.8	.853	35.8	3.888	35
8598	6866	.872	35.2	98.1	3.477	.777	.004	.055	.922	1.92	2.80	.84	4882	41.9	.844	34.1	3.771	36
6534	6881	.863	36.3	98.1	3.482	.774	.002	.057	.969	1.94	2.80	.84	4818	41.9	.850	34.2	3.774	37
5937	6259	.785	33.4	88.8	3.001	.777	.004	.059	.938	1.54	2.17	.83	4620	42.5	.849	32.7	3.488	38

TABLE II. - PERFORMANCE DATA OBTAINED AFTER ENGINE OVERHAUL WITH COLD INLET-AIR TEMPERATURES

[Inlet guide vanes open.]

Run	Com- pressor Reynolds number index, $\frac{G_1}{\sqrt{1/\theta_1}}$	Altitude- exhaust pressure, P_0 lb/sq ft	Flight Mach number, M_0	Equi- valent ambient air static tempera- ture, T_0 , $^{\circ}R$	Engine- inlet total tempera- ture, T_1 , $^{\circ}R$	Engine- inlet total pressure, P_1 , lb sq ft abs	Compressor- outlet total tempera- ture, T_2 , $^{\circ}R$	Compressor- outlet total pressure, P_2 , lb sq ft abs	Turbine- inlet total tempera- ture, T_3 , $^{\circ}R$	Turbine- inlet total pressure, P_3 , lb sq ft abs	Turbine- outlet total tempera- ture, T_4 , $^{\circ}R$	Turbine- outlet total pressure, P_4 , lb sq ft abs	Tail- pipe total tempera- ture, T_5 , $^{\circ}R$	Tail- pipe total pressure, P_5 , lb sq ft abs
Exhaust-nozzle area, 2.368 sq ft														
1	0.470	475	0.821	556	406	739	865	6163	2010	5919	1610	2046	1615	1991
2	.475	478	.819	566	415	742	873	6046	2018	5810	1612	2009	1617	1955
3	.453	484	.813	585	434	747	891	5920	1987	5672	1621	1947	1600	1909
4	.480	481	.819	563	412	747	848	---	---	---	1533	---	---	---
5	.442	481	.820	585	437	748	874	5730	1913	5501	1547	1680	1529	1837
6	.489	485	.813	560	408	749	827	---	---	---	1468	---	---	---
7	.456	482	.818	568	440	745	847	5547	1800	5158	1442	1754	1437	1716
8	.489	483	.824	557	408	754	802	5550	1753	5390	1392	1645	1400	1796
9	.488	480	.817	562	410	744	776	5067	1617	4867	1263	1686	1285	1626
10	.439	492	.799	590	440	749	772	4136	1456	3951	1148	1356	1154	1322
11	.418	478	.809	599	451	735	687	1961	1063	1880	856	736	871	719
12	.340	291	.826	526	575	456	828	4032	2007	3873	1618	1529	1607	1296
13	.344	298	.819	524	567	461	905	3926	1920	3781	1548	1299	1540	1269
14	.334	303	.803	522	564	463	781	3968	1837	3814	1472	1262	1466	1234
15	.338	293	.813	523	568	462	784	3617	1737	3487	1366	1186	1366	1156
16	.341	298	.804	530	573	456	730	3375	1587	3262	1262	1108	1266	1076
17	.267	297	.797	591	441	451	699	3606	2017	3467	1693	1182	1621	1153
18	.261	287	.822	589	442	447	690	3347	1975	3411	1605	1165	1580	1138
19	.276	299	.803	588	439	460	842	3243	1780	3104	1438	1058	1422	1031
20	.274	311	.792	593	442	470	784	2597	1497	2474	1192	837	1169	817
21	.271	508	.793	596	446	466	645	1068	1070	1028	859	422	872	413
22	.206	181	.829	537	583	284	843	2467	2037	2369	1651	814	1640	791
23	.205	182	.820	538	584	283	806	2540	1890	2252	1539	769	1520	752
24	.215	194	.794	540	583	284	768	2267	1787	2184	1466	737	1437	720
25	.212	190	.806	539	583	291	747	2075	1620	2001	1310	661	1294	665
26	.163	176	.841	587	442	278	911	2280	2067	2189	1690	756	1660	722
27	.166	177	.837	589	444	280	890	2192	1975	2108	1606	715	1584	698
28	.156	170	.832	594	448	280	860	2006	1833	1930	1484	652	1465	636
29	.180	186	.802	413	464	284	799	1482	1510	1426	1218	489	1209	470
30	.160	184	.784	411	461	291	701	773	1227	740	978	288	998	280
31	.161	197	.409	570	382	221	832	1766	1990	1708	1653	679	1587	563
32	.166	189	.417	569	382	213	783	1644	1787	1593	1486	545	1438	527
33	.160	197	.408	570	382	221	908	1562	1737	1606	1372	518	1356	504
34	.126	192	.436	425	441	219	901	1661	2037	1596	1686	546	1639	531
35	.127	188	.486	424	442	218	865	1549	1885	1489	1544	504	1512	490
36	.133	198	.436	429	445	226	786	1176	1550	1158	1274	598	1267	567
37	.127	196	.434	432	446	223	712	601	1510	872	1251	247	1273	245
Exhaust-nozzle area, 2.514 sq ft														
38	0.180	185	0.800	569	416	282	866	2269	1897	2209	1487	707	1602	684
39	.177	179	.823	566	415	279	856	2254	1860	2132	1460	677	1469	664
40	.178	183	.808	567	415	281	814	1975	1697	1891	1328	542	1332	517
41	.178	184	.802	568	415	281	743	1657	1385	1564	1111	510	1082	490
42	.178	183	.804	567	414	280	871	1187	1140	1119	904	371	885	359
43	.154	190	.792	419	471	267	931	2173	1990	2092	1568	686	1583	668
44	.166	186	.799	---	---	263	---	2082	---	1895	1572	659	---	639
45	.168	201	.736	402	446	286	856	1689	1757	1803	1419	589	1366	571
46	.168	197	.768	408	454	291	800	1545	1600	1484	1181	489	1191	474
47	.141	198	.413	599	413	223	873	---	1953	---	1554	---	1548	---
48	.142	196	.451	598	413	225	852	1709	1867	1653	1517	532	1482	507
49	.140	193	.444	597	413	221	819	1599	1740	1556	1394	505	1379	485
50	.137	188	.450	597	413	216	781	1381	1523	1346	1230	440	1211	424
51	.134	186	.453	599	416	214	697	1031	1287	1004	1041	339	1029	327
Exhaust-nozzle area, 2.694 sq ft														
52	0.180	174	0.843	555	405	277	851	2305	1817	2211	1403	676	1422	651
53	.179	175	.858	556	406	277	833	2212	1737	2127	1330	646	1357	622
54	.180	180	.824	561	410	261	796	2035	1579	1945	1228	591	1329	564
55	.172	173	.831	564	414	272	738	1864	1337	1590	1044	487	1056	457
56	.170	180	.810	576	425	277	644	856	995	825	785	216	779	207
57	.143	188	.406	592	405	222	634	1741	1826	1666	1426	502	1426	480

TABLE II. - Concluded. PERFORMANCE DATA OBTAINED AFTER ENGINE OVERHAUL WITH COLD INLET-AIR TEMPERATURES

[inlet guide vanes open]

Engine speed, rpm	Corrected engine speed, $\frac{N}{\sqrt{\theta_1}}$ rpm	Compressor inlet tip Mach number, M_c	Engine air flow, $W_{a,1}$ lb/sec	Corrected air flow, $W_{a,1} \sqrt{\frac{\theta_1}{\theta_2}}$ lb/sec	Compressor pressure ratio, P_2/P_1	Compressor efficiency, η_c	Compressor discharge and combustor pressure loss ratio, $\frac{P_3 - P_2}{P_3}$	Combustion efficiency, η_b	Combustion parameter, $\frac{P_4 T_4}{P_3 T_3}$ 10 ⁻⁴	Combustion parameter, $\frac{P_4 T_4}{P_3 T_3}$ 10 ⁻⁴	Turbine Reynolds number index, $\frac{W_{a,1} T_4}{c_p \sqrt{\theta_4}}$	Corrected turbine speed, $\frac{N}{\sqrt{\theta_4}}$ rpm	Corrected turbine gas flow, $W_{g,5} \sqrt{\frac{\theta_4}{\theta_5}}$ lb/sec	Turbine efficiency, η_t	Corrected turbine enthalpy drop, $\Delta h_{t,5}$ Btu/lb-sec	Turbine pressure ratio, P_5/P_4	Run
Exhaust-nozzle area, 2.365 sq ft																	
7975	9016	1.131	59.7	151.1	8.340	0.754	0.040	0.933	6.44	9.84	0.58	4108	42.8	0.862	30	2.893	1
7958	8900	1.118	58.8	148.8	8.148	0.740	0.039	0.932	6.30	9.50	0.55	4081	43.0	0.874	29	2.892	2
7943	8887	1.089	57.3	146.4	7.926	0.761	0.042	0.931	6.19	9.17	0.50	4113	42.6	0.870	29	2.913	3
7763	8713	1.083	59.8	160.4	8.000	0.785	0.040	1.025	9.18	9.18	0.56	4089	42.6	0.864	30	2.926	4
7748	8444	1.058	56.8	147.4	7.680	0.785	0.040	0.978	8.65	8.68	0.56	4089	42.6	0.864	30	2.926	5
7589	8580	1.073	58.5	148.1	8.000	0.785	0.040	1.001	8.56	8.56	0.56	4089	42.6	0.864	30	2.926	6
7424	8063	1.011	54.8	145.3	7.177	0.814	0.040	0.995	5.28	7.87	0.55	4034	42.6	0.868	29	2.926	7
7363	8324	1.044	57.9	143.6	7.401	0.789	0.034	1.009	5.45	8.10	0.59	4053	42.3	0.864	29	2.921	8
6997	7887	0.987	56.4	140.1	6.810	0.815	0.040	0.998	4.89	7.12	0.56	4002	42.9	0.857	29	2.921	9
6747	7110	0.892	47.1	122.6	5.622	0.834	0.045	0.971	3.67	5.44	0.54	3945	42.5	0.851	29	2.914	10
6287	5650	0.708	24.8	66.4	2.688	0.878	0.052	0.914	1.57	2.16	0.36	3686	40.5	0.875	26	2.527	11
7941	9367	1.175	58.2	160.8	8.862	0.708	0.038	0.981	4.50	6.15	0.37	4097	41.9	0.888	28	2.916	12
7773	9244	1.157	56.8	156.8	8.708	0.708	0.038	0.979	4.39	5.88	0.38	4092	42.5	0.888	28	2.916	13
7748	9083	1.137	58.7	147.9	8.570	0.739	0.039	0.972	4.12	5.87	0.40	4082	41.0	0.840	29	3.022	14
7382	8742	1.036	57.5	147.8	8.002	0.754	0.038	0.984	3.64	5.20	0.39	4089	42.2	0.852	29	2.940	15
6998	8254	1.035	56.1	142.0	7.401	0.808	0.034	0.945	3.19	4.57	0.40	4040	41.3	0.838	28	2.944	16
7947	8621	1.081	53.6	146.3	7.996	0.770	0.039	0.956	3.89	5.48	0.33	4085	41.5	0.853	29	2.933	17
7830	8480	1.065	53.6	146.9	7.935	0.780	0.038	0.935	3.79	5.31	0.33	4070	41.5	0.867	29	2.928	18
7385	8008	1.004	53.0	139.7	7.050	0.808	0.043	0.856	3.22	4.70	0.34	4026	42.2	0.862	29	2.939	19
6819	7175	0.899	29.0	120.5	5.526	0.812	0.047	0.960	2.56	3.46	0.33	3936	42.4	0.840	29	2.906	20
6438	5435	0.882	14.0	59.0	2.292	0.588	0.058	0.819	0.82	1.22	0.20	3548	41.3	0.857	24	2.436	21
7877	9169	1.150	22.9	146.6	8.687	0.708	0.040	0.932	2.69	3.75	0.22	4032	41.3	0.858	28	2.910	22
7608	8844	1.109	25.2	149.4	8.289	0.748	0.036	0.937	2.39	3.53	0.23	4087	43.5	0.845	29	2.929	23
7406	8819	1.081	22.9	141.4	7.711	0.749	0.037	0.947	2.270	3.29	0.25	4028	41.9	0.845	29	2.907	24
6935	8072	1.012	22.3	139.3	7.131	0.793	0.056	0.937	1.96	2.88	0.24	3967	42.1	0.838	29	2.939	25
7980	8658	1.065	20.7	145.1	8.201	0.771	0.040	0.907	2.55	3.45	0.20	4063	40.7	0.853	30	2.986	26
7748	8377	1.050	20.3	141.7	7.828	0.781	0.039	0.911	2.40	3.21	0.20	4025	40.5	0.853	29	2.948	27
7306	7919	0.993	19.3	135.7	7.171	0.816	0.039	0.905	2.11	2.83	0.20	3963	40.4	0.846	29	2.960	28
6742	6919	0.885	15.7	110.3	5.218	0.832	0.038	0.892	1.42	1.89	0.20	3870	38.9	0.820	28	2.940	29
6702	5838	0.752	8.9	60.8	2.656	0.821	0.043	0.718	1.68	0.89	0.12	3634	36.2	0.837	25	2.569	30
7651	8918	1.116	17.1	140.4	7.991	0.696	0.033	0.903	1.85	2.73	0.18	3960	43.6	0.866	29	2.950	31
7266	8458	1.061	16.3	138.8	7.718	0.704	0.031	0.932	1.68	2.34	0.18	3946	42.0	0.851	29	2.933	32
6888	8145	1.021	18.1	132.6	7.068	0.671	0.035	0.878	1.53	2.19	0.17	3862	43.0	0.826	31	2.911	33
7814	8477	1.063	15.8	140.9	7.584	0.747	0.039	0.905	1.76	2.69	0.15	3998	42.4	0.854	29	2.928	34
7430	8067	1.010	14.9	135.4	7.106	0.760	0.039	0.891	1.83	2.26	0.15	3952	41.0	0.843	29	2.924	35
6736	7058	0.885	12.5	108.4	5.204	0.784	0.032	0.801	1.12	2.83	0.15	3820	40.5	0.799	27	2.880	36
5403	5869	0.756	5.7	49.9	2.695	0.856	0.048	0.719	0.65	0.72	0.07	3229	36.2	0.812	22	2.316	37
Exhaust-nozzle area, 2.514 sq ft																	
7924	8651	1.110	21.9	146.9	8.117	0.733	0.035	0.902	2.42	3.29	0.22	4198	40.8	0.861	31	3.124	38
7830	8762	1.089	22.0	148.5	8.007	0.762	0.048	0.911	2.30	3.23	0.22	4182	41.9	0.850	31	3.150	39
7406	8279	1.058	21.5	144.4	7.028	0.775	0.043	0.951	1.84	2.66	0.22	4139	43.9	0.857	30	3.489	40
6749	7324	0.918	18.1	122.1	5.897	0.834	0.056	0.876	1.53	1.96	0.18	4041	40.2	0.857	30	3.067	41
6702	6440	0.808	15.2	102.5	4.239	0.823	0.067	0.831	0.94	1.34	0.20	3929	42.6	0.862	29	3.017	42
7930	8325	1.044	20.4	142.9	7.971	0.795	0.037	0.913	2.35	3.22	0.20	4108	41.1	0.856	30	3.060	43
7756	8000	0.997	19.9	135.3	7.357	0.800	0.030	0.900	2.00	2.70	0.20	4052	43.5	0.861	30	3.028	44
7373	7954	0.997	19.9	135.3	7.357	0.789	0.031	0.903	1.82	2.76	0.20	4052	43.5	0.861	30	3.061	45
6636	7965	0.880	17.1	116.5	5.308	0.800	0.051	0.933	1.41	2.04	0.20	3930	41.8	0.826	29	3.035	46
7984	8927	1.119	17.0	145.5	8.000	0.785	0.040	0.948	2.62	3.22	0.20	4183	41.8	0.856	30	3.060	47
7780	8704	1.091	16.8	139.3	7.596	0.735	0.033	0.924	1.78	2.46	0.17	4147	40.9	0.844	30	3.108	48
7420	8317	1.045	16.0	135.6	7.235	0.772	0.046	0.907	1.62	2.21	0.17	4098	40.5	0.843	30	3.065	49
6721	7634	0.946	14.9	129.8	6.394	0.830	0.025	0.938	1.30	1.60	0.18	3982	40.3	0.817	29	3.059	50
5953	6657	0.835	12.0	106.9	4.816	0.858	0.026	0.883	0.90	1.23	0.18	3793	39.6	0.824	28	3.982	51
Exhaust-nozzle area, 2.694 sq ft																	
7952	9003	1.129	22.4	151.0	8.321	0.751	0.041	0.902	2.40	3.18	0.23	4301	40.7	0.850	32	3.271	52
7780	8786	1.103	22.7	153.5	7.986	0.789	0.038	0.949	2.18	3.08	0.24	4259	41.9	0.845	32	3.293	53
7369	8291	1.040	22.0	147.1	7.242	0.807	0.044	0.938	1.91	2.70	0.25	4285	42.1	0.840	31	3.291	54
6889	7373	0.926	16.9	131.0	6.118	0.887	0.045	0.859	1.49	1.95	0.24	4135	40.4	0.837	31	3.293	55
5368	5954	0.747	11.1	77.0	3.090	0.738	0.056	0.862	0.67	0.67	0.18	3830	39.8	0.800	28	3.820	56
7924	8971	1.125	17.1	145.6	7.842	0.719	0.043	0.926	1.60	2.47	0.18	4276	41.3	0.842	32	3.319	57

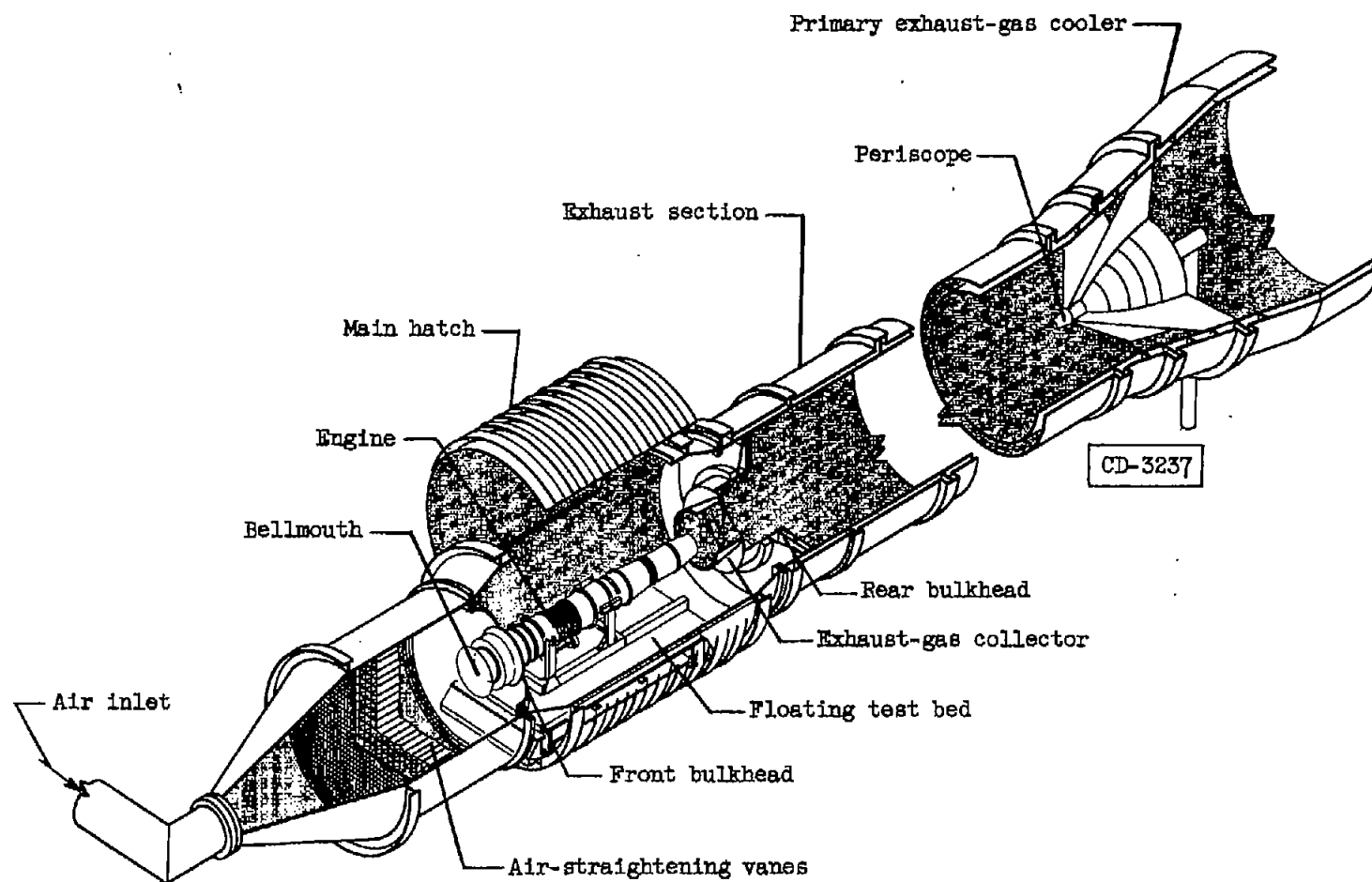


Figure 1. - Schematic diagram of altitude test chamber.

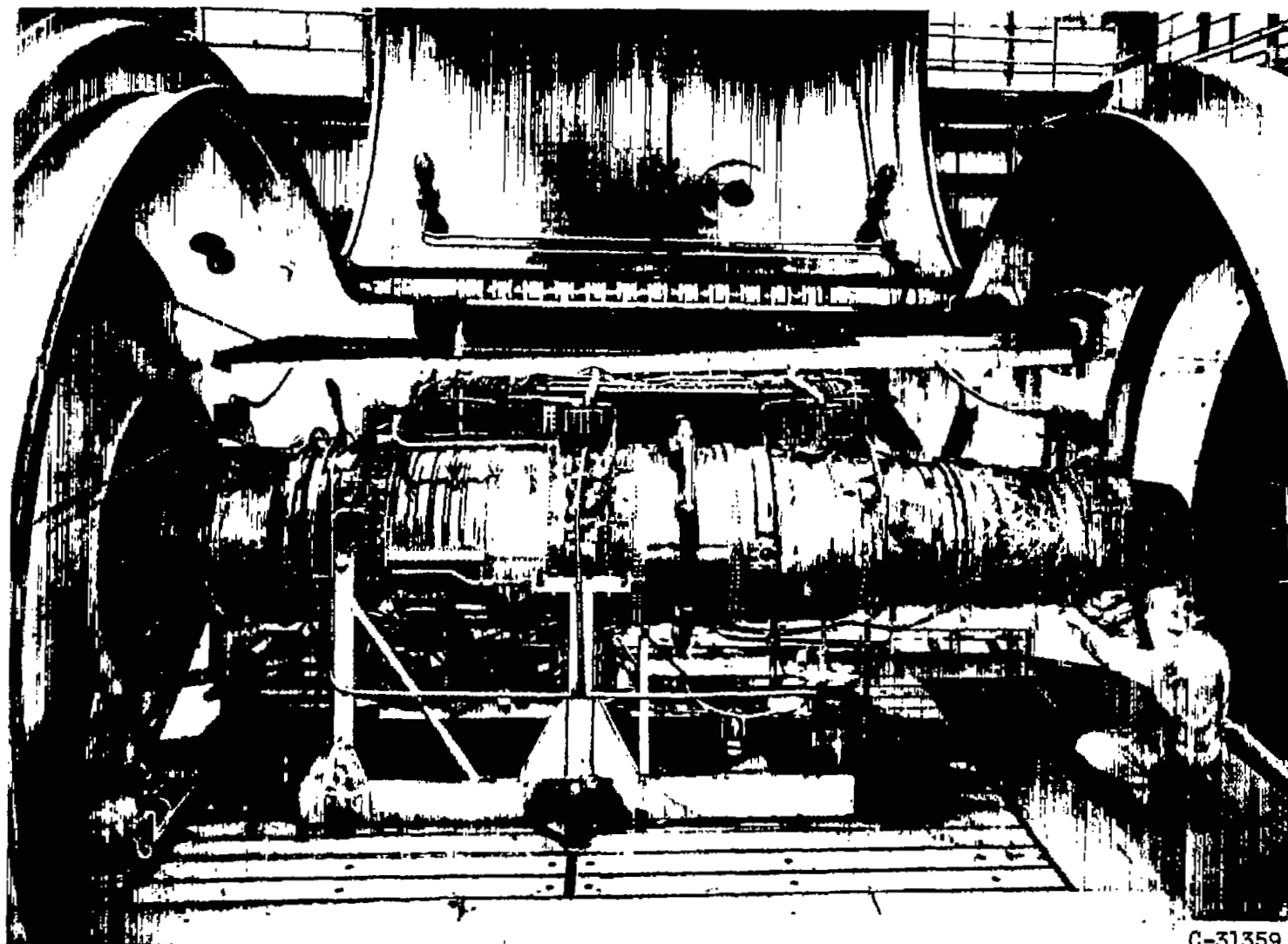


Figure 2. - Installation of YJ73-GE-3 turbojet engine in altitude test chamber.

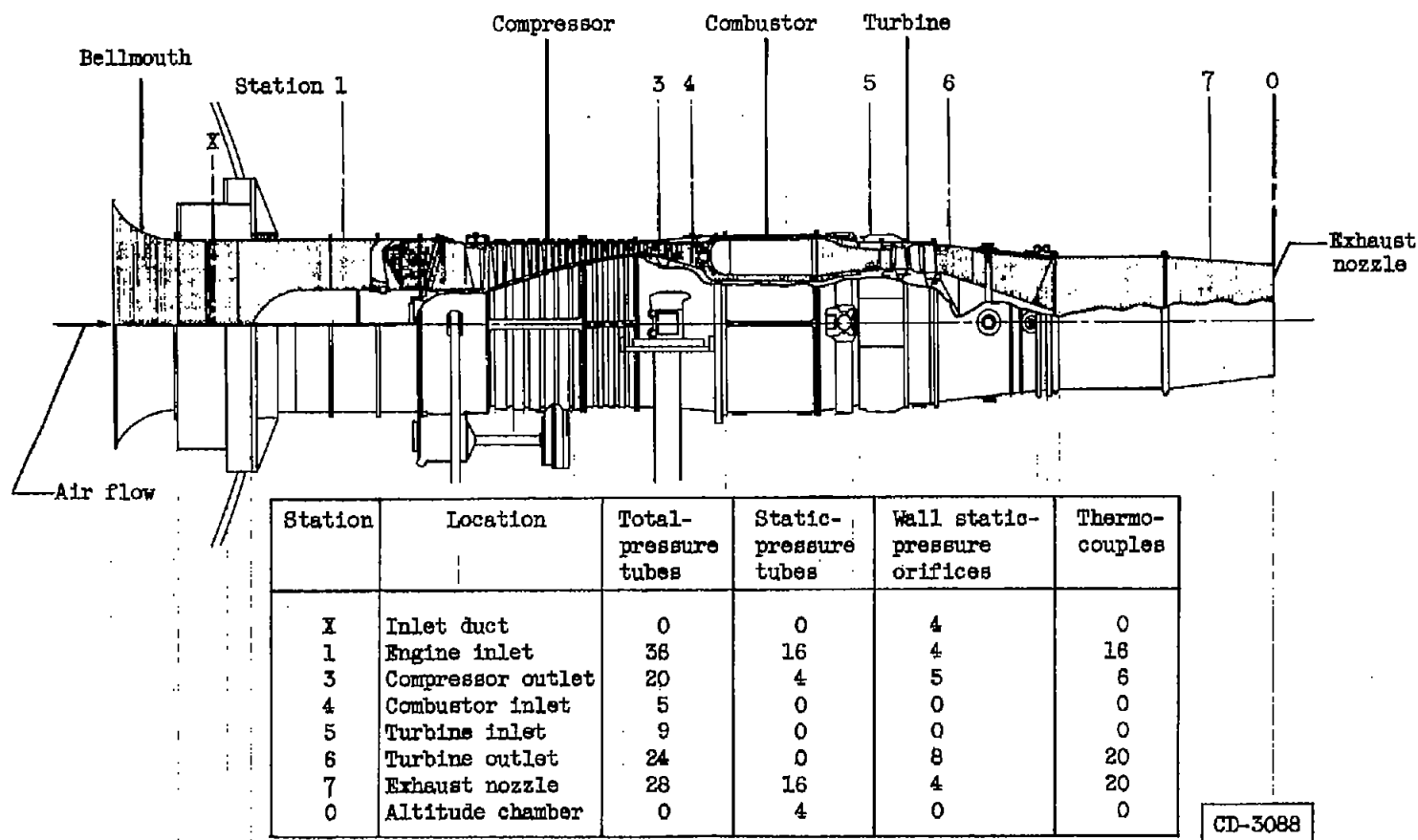
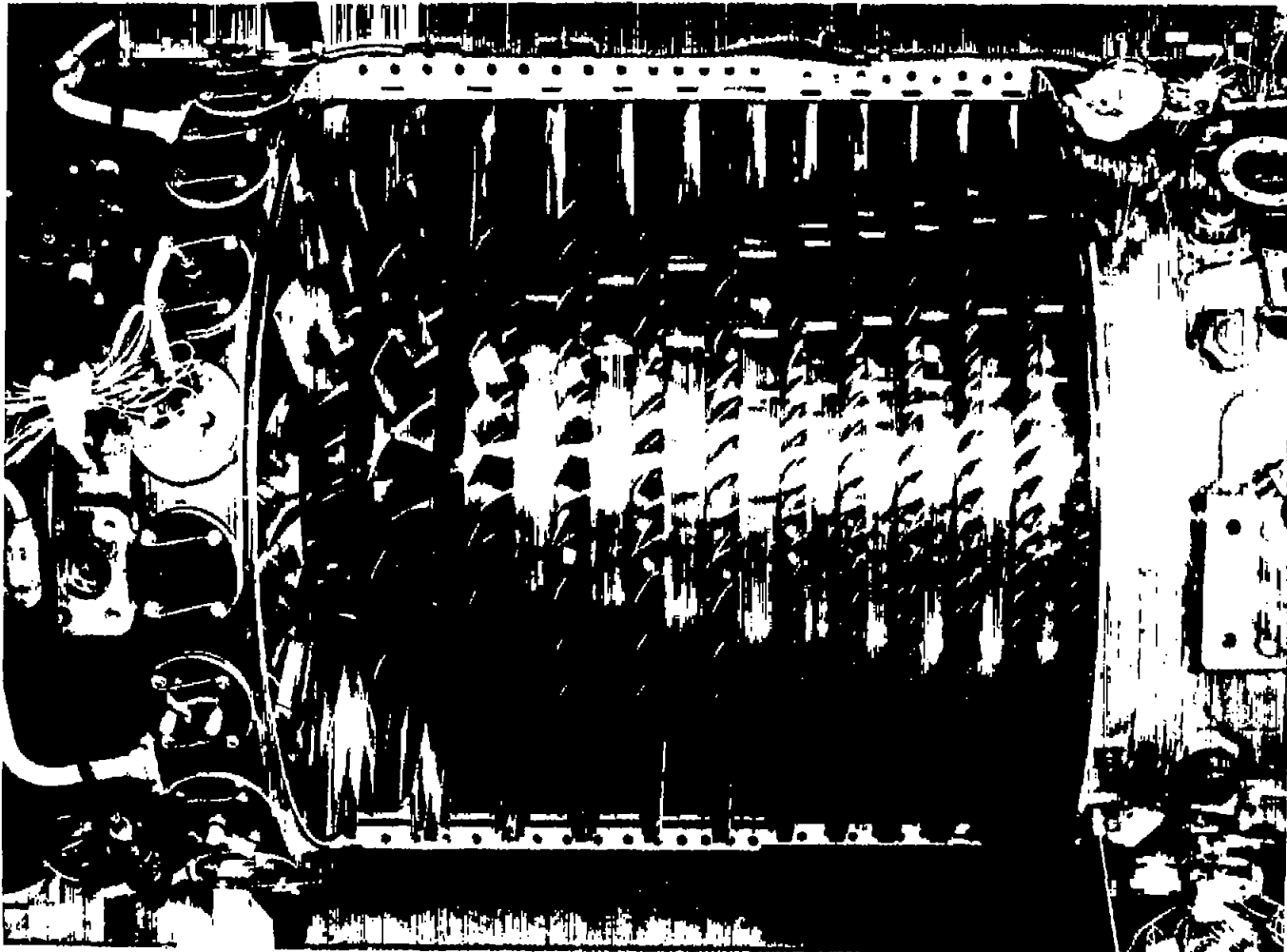


Figure 3. - Cross section of YJ73-GE-3 turbojet engine showing location of instrumentation.



C-31050

(a) Compressor rotor.

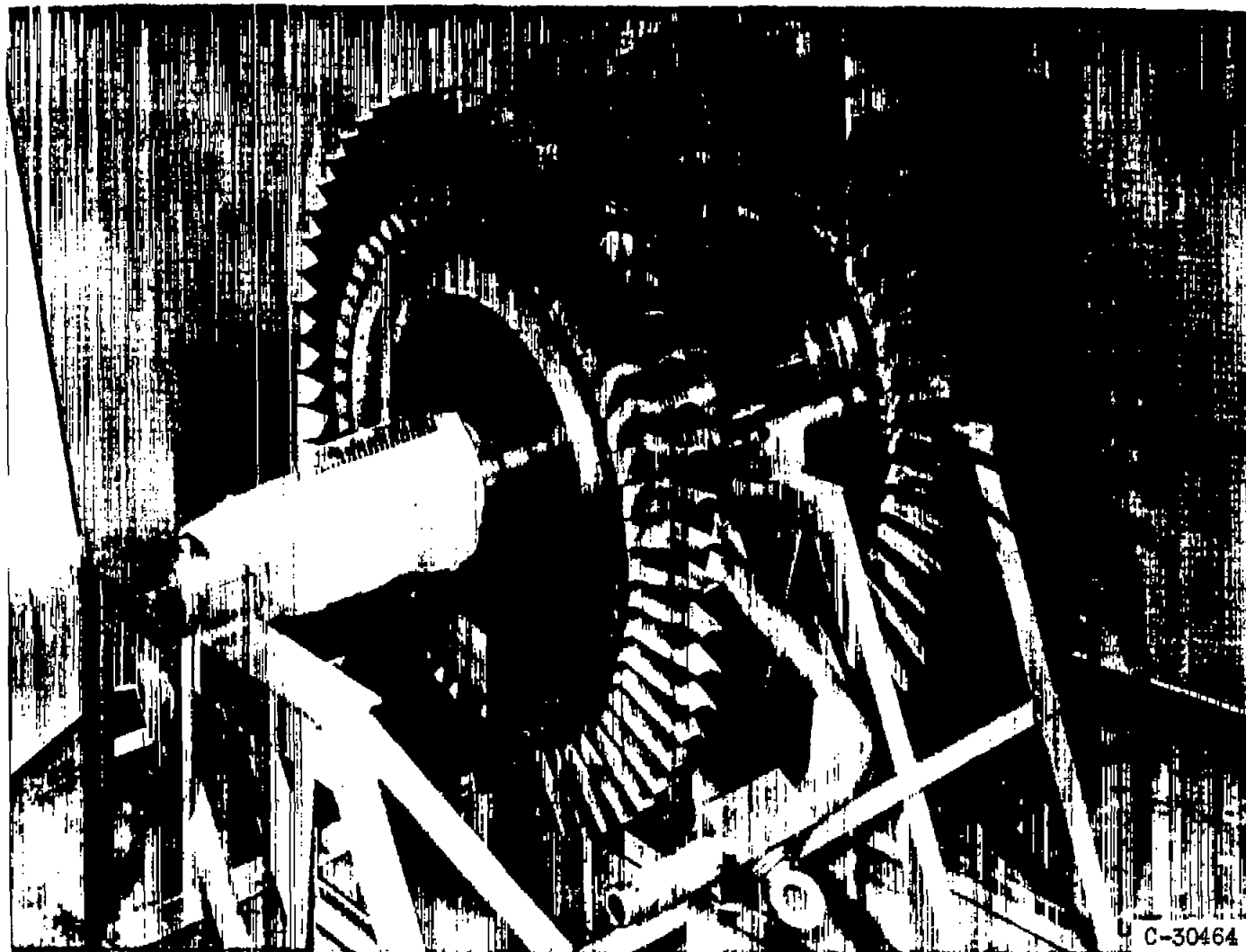
Figure 4. - Components of YJ73-GE-3 engine.



C-30463

(b) Combustor liner and transition section.

Figure 4. - Continued. Components of YJ73-GE-3 engine.



(c) Turbine rotor.

Figure 4. - Concluded. Components of YJ73-GE-3 engine.

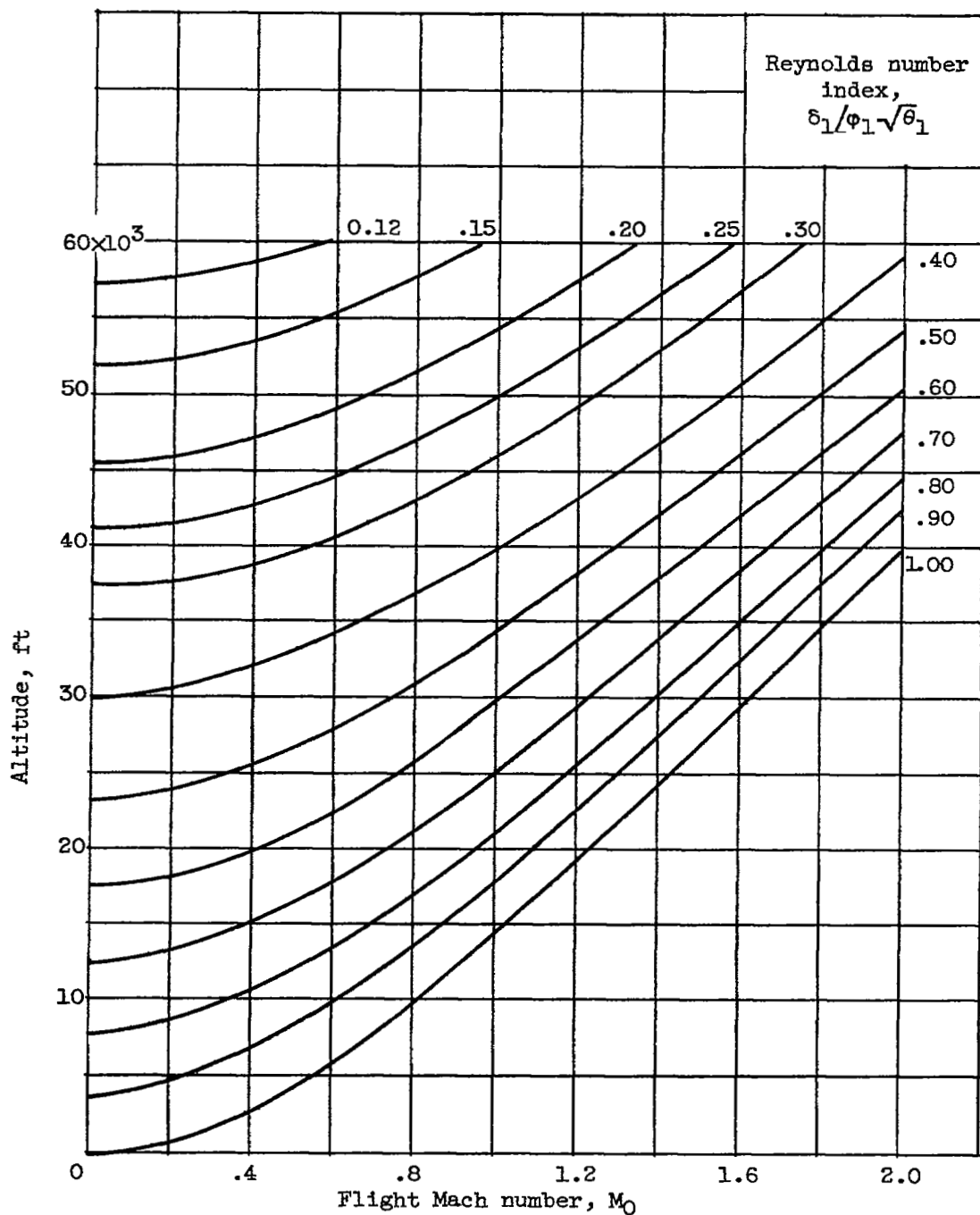
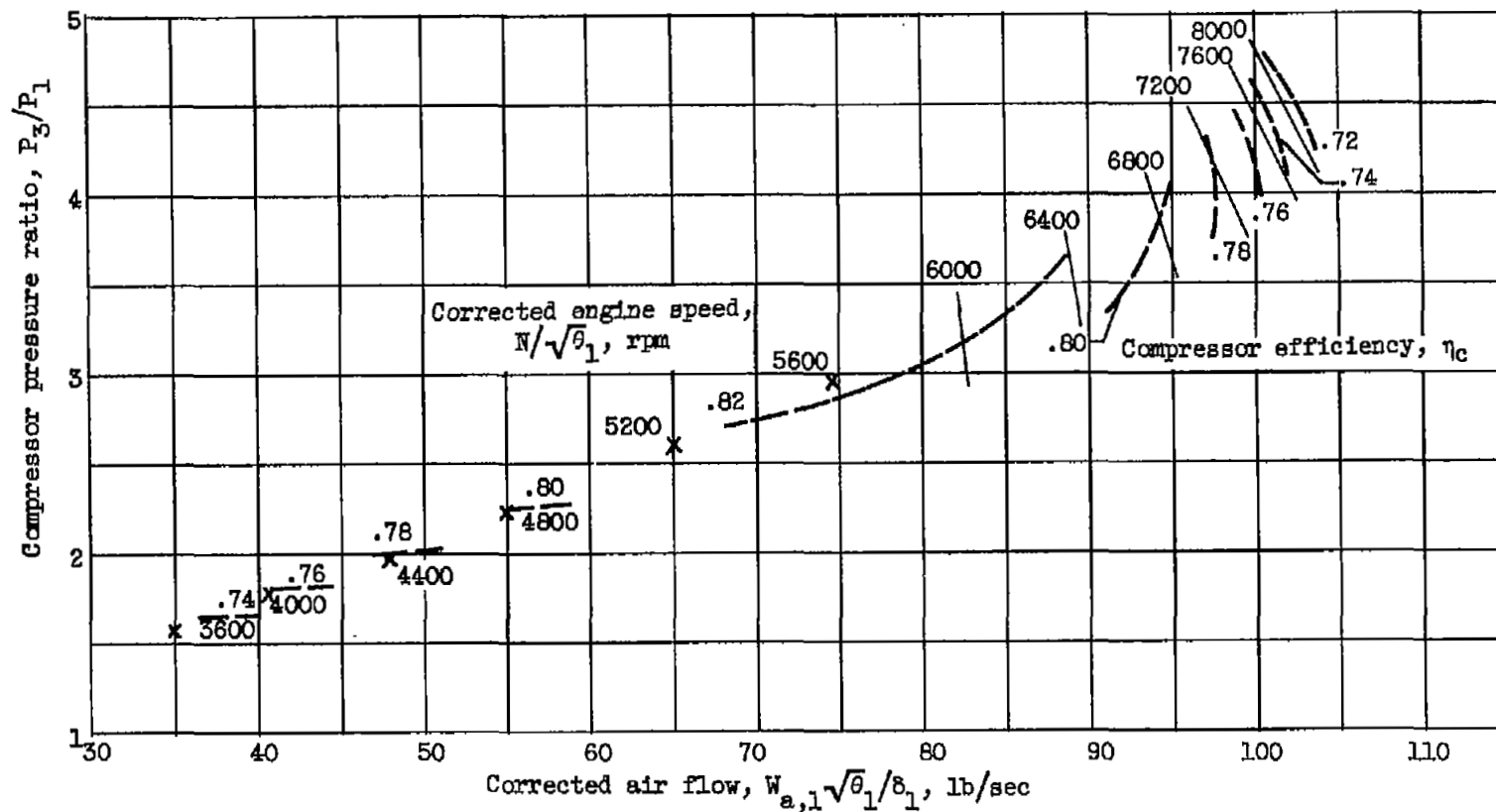
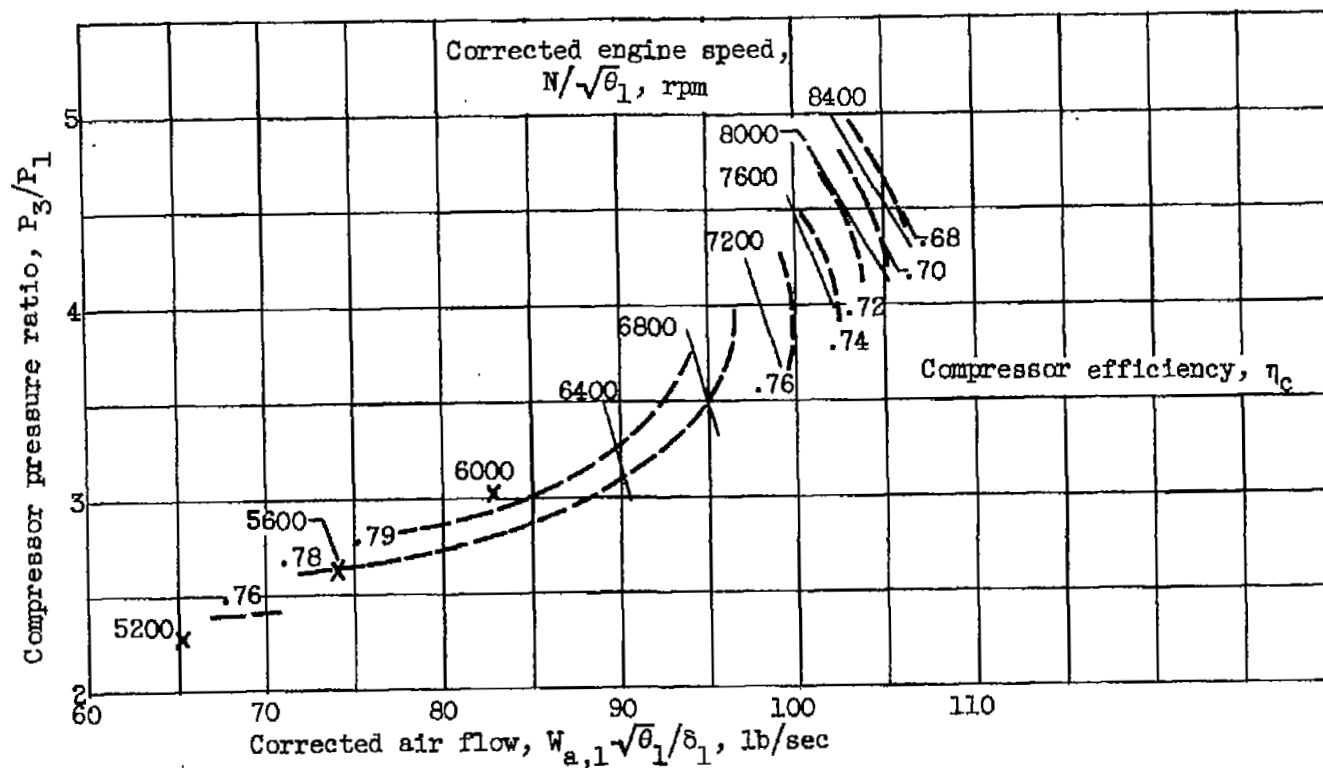


Figure 5. - Variation of Reynolds number index with altitude and flight Mach number at standard NACA conditions.



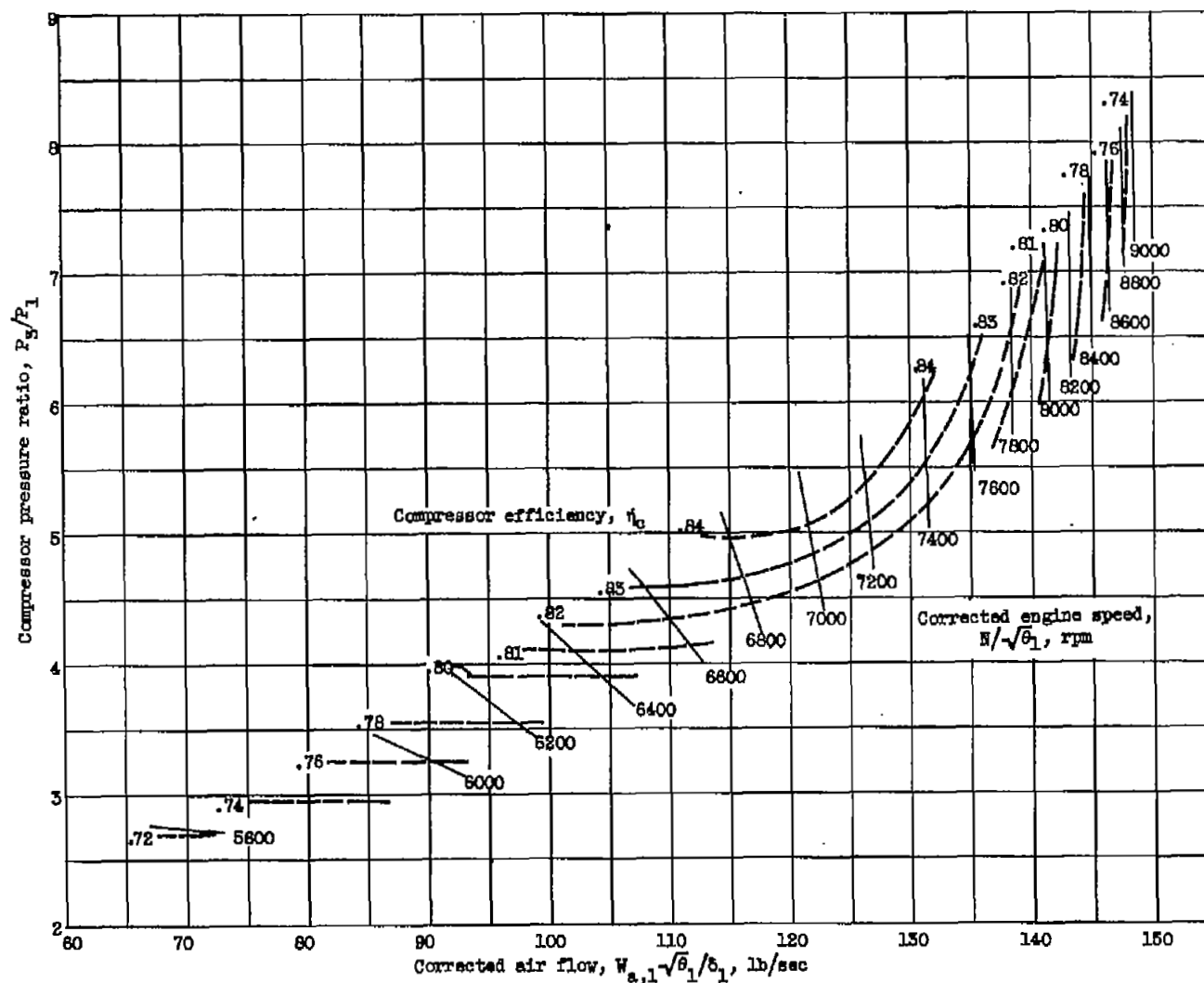
(a) Inlet guide vanes closed; Reynolds number index, 0.96.

Figure 6. - Compressor performance maps.



(b) Inlet guide vanes closed; Reynolds number index, 0.40.

Figure 6. - Continued. Compressor performance maps.



(c) Inlet guide vanes open; Reynolds number index, 0.39.

Figure 6. - Concluded. Compressor performance maps.

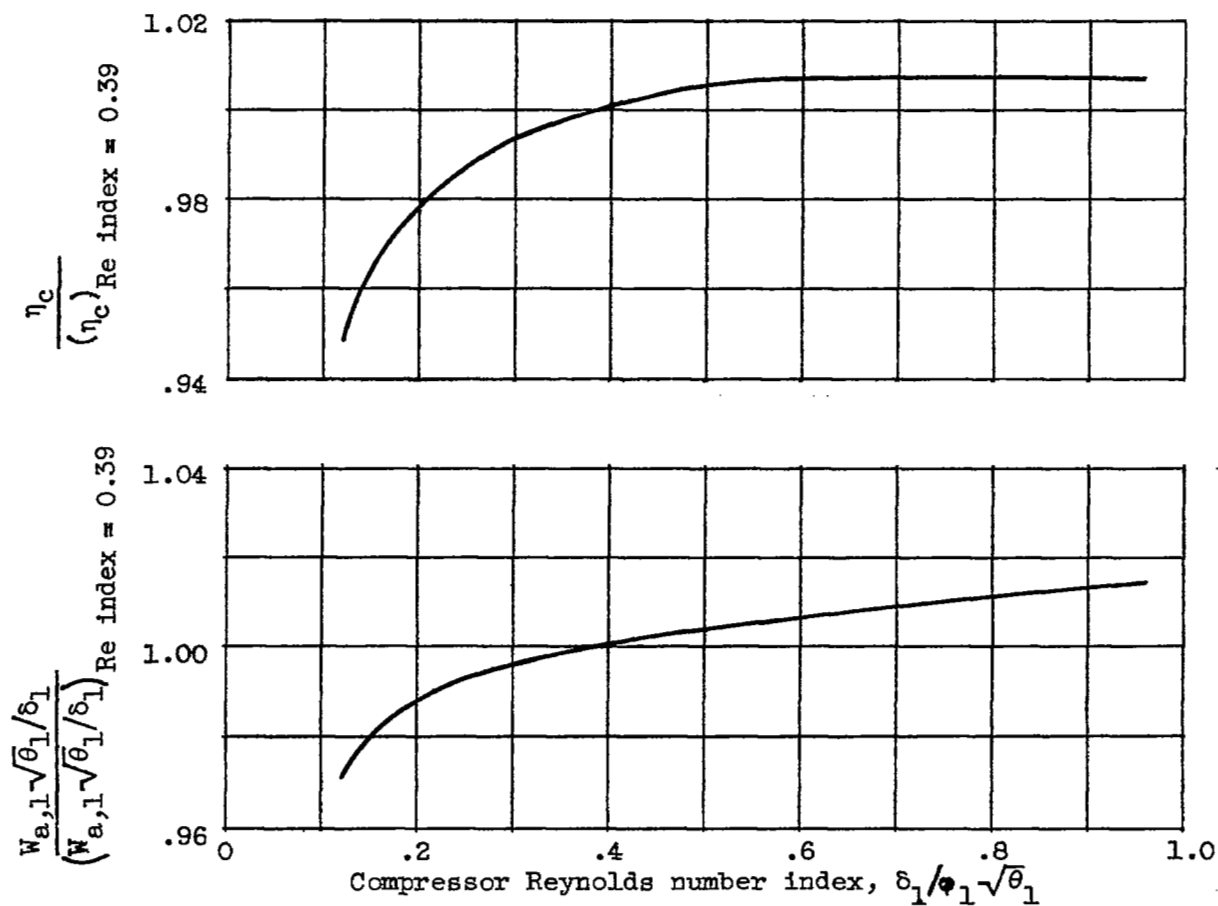


Figure 7. - Effect of compressor Reynolds number index on compressor efficiency and corrected air flow. Inlet guide vanes open. Applicable at all compressor pressure ratios at corrected engine speeds of 6800 rpm and above.

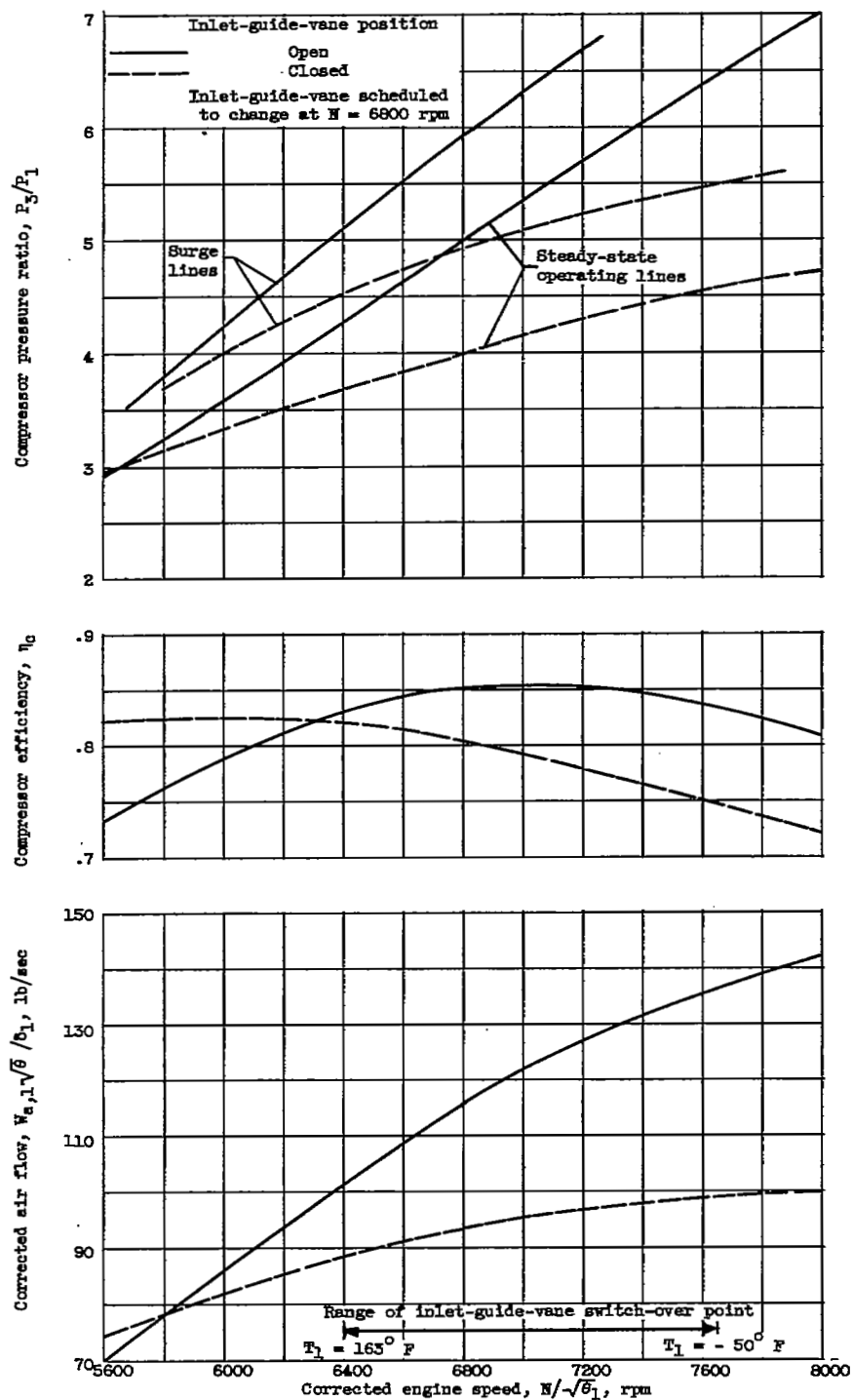
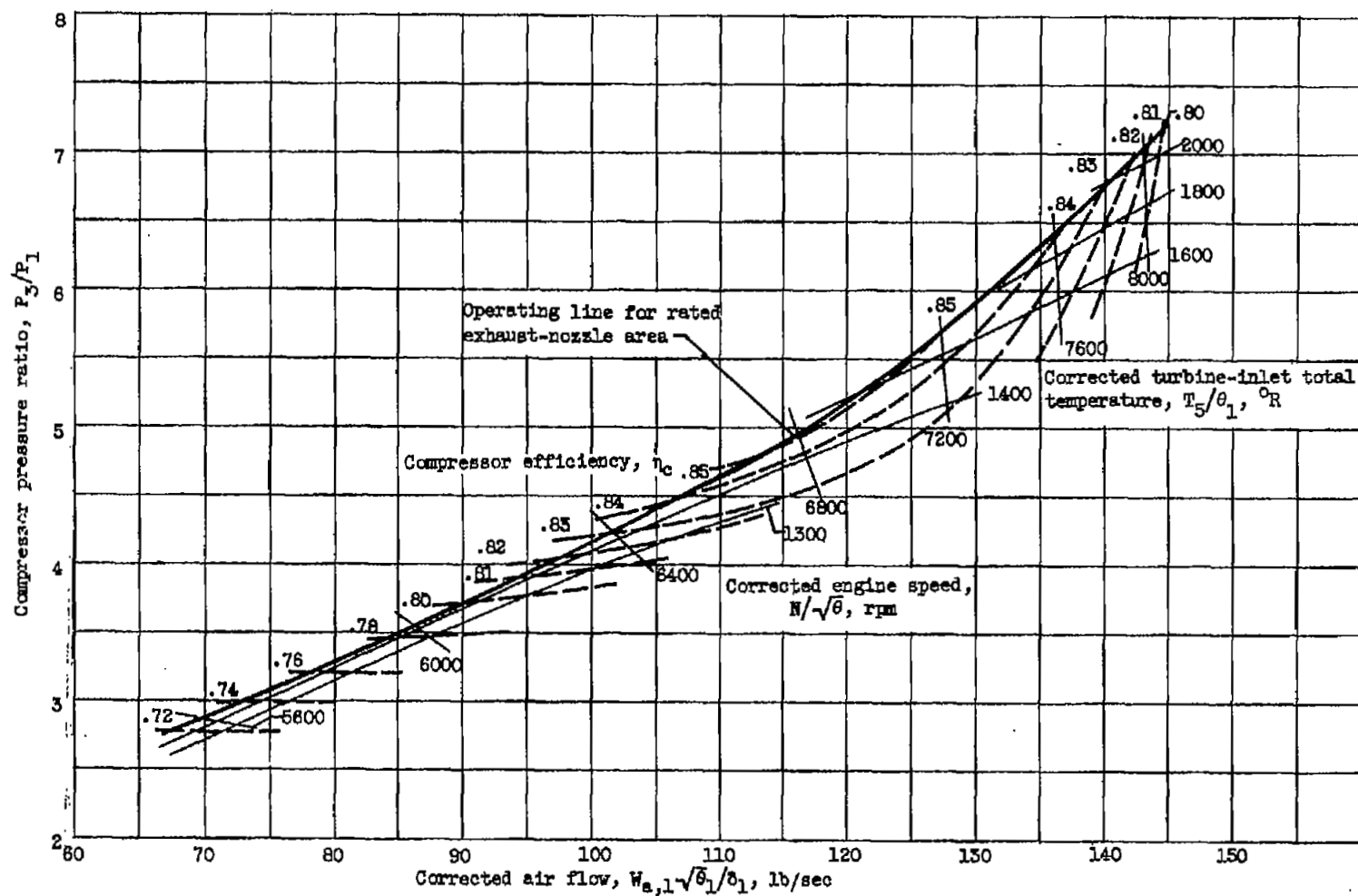
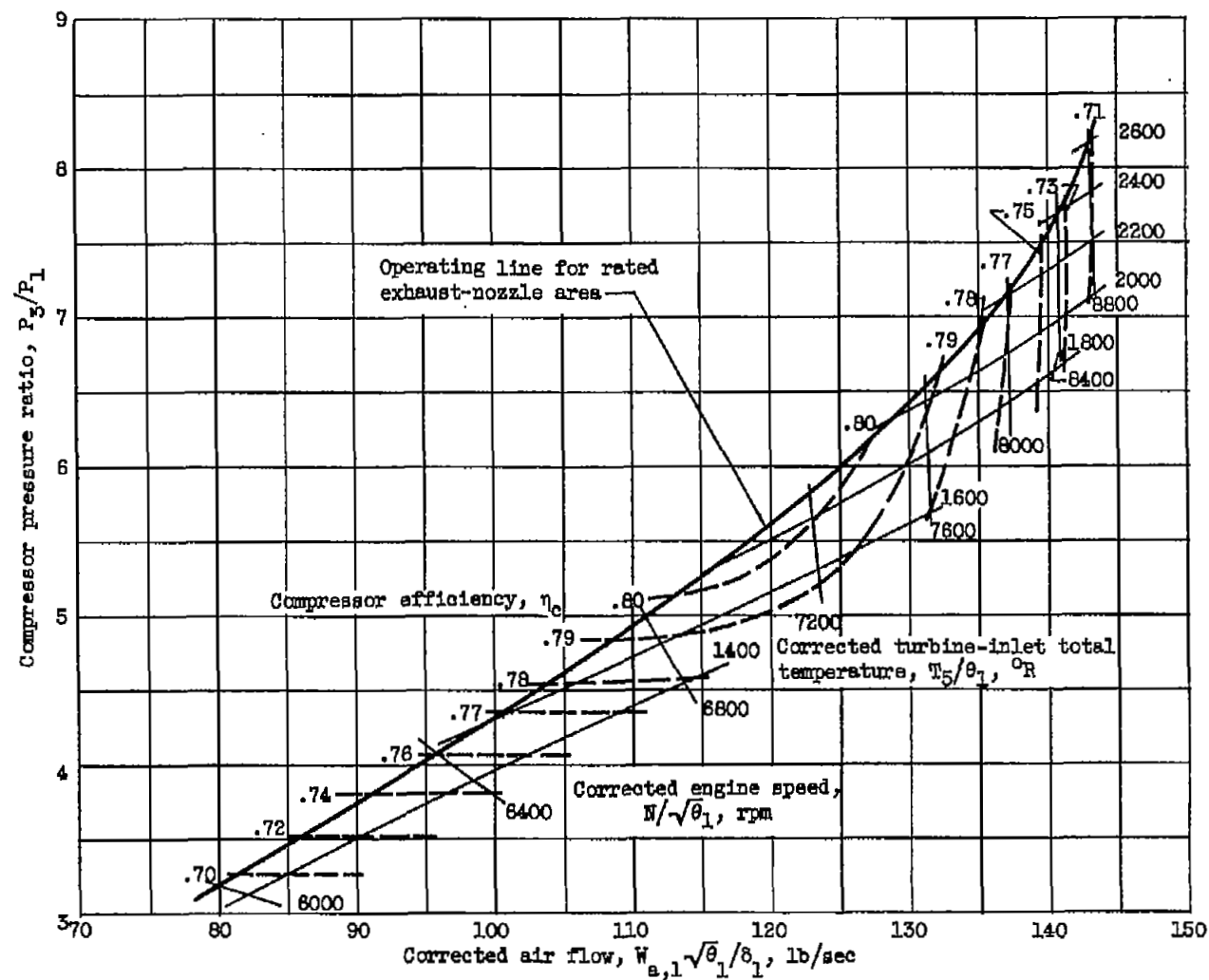


Figure 8. - Effect of inlet-guide-vane position on compressor pressure ratio, efficiency, and corrected air flow for rated exhaust-nozzle area. Reynolds number index, 0.96.



(a) Reynolds number inuex, 0.96.

Figure 9. - Compressor performance map showing lines of constant corrected turbine-inlet temperature. Inlet guide vanes open.



(b) Reynolds number index, 0.12.

Figure 9. - Concluded. Compressor performance map showing lines of constant corrected turbine-inlet temperature. Inlet guide vanes open.

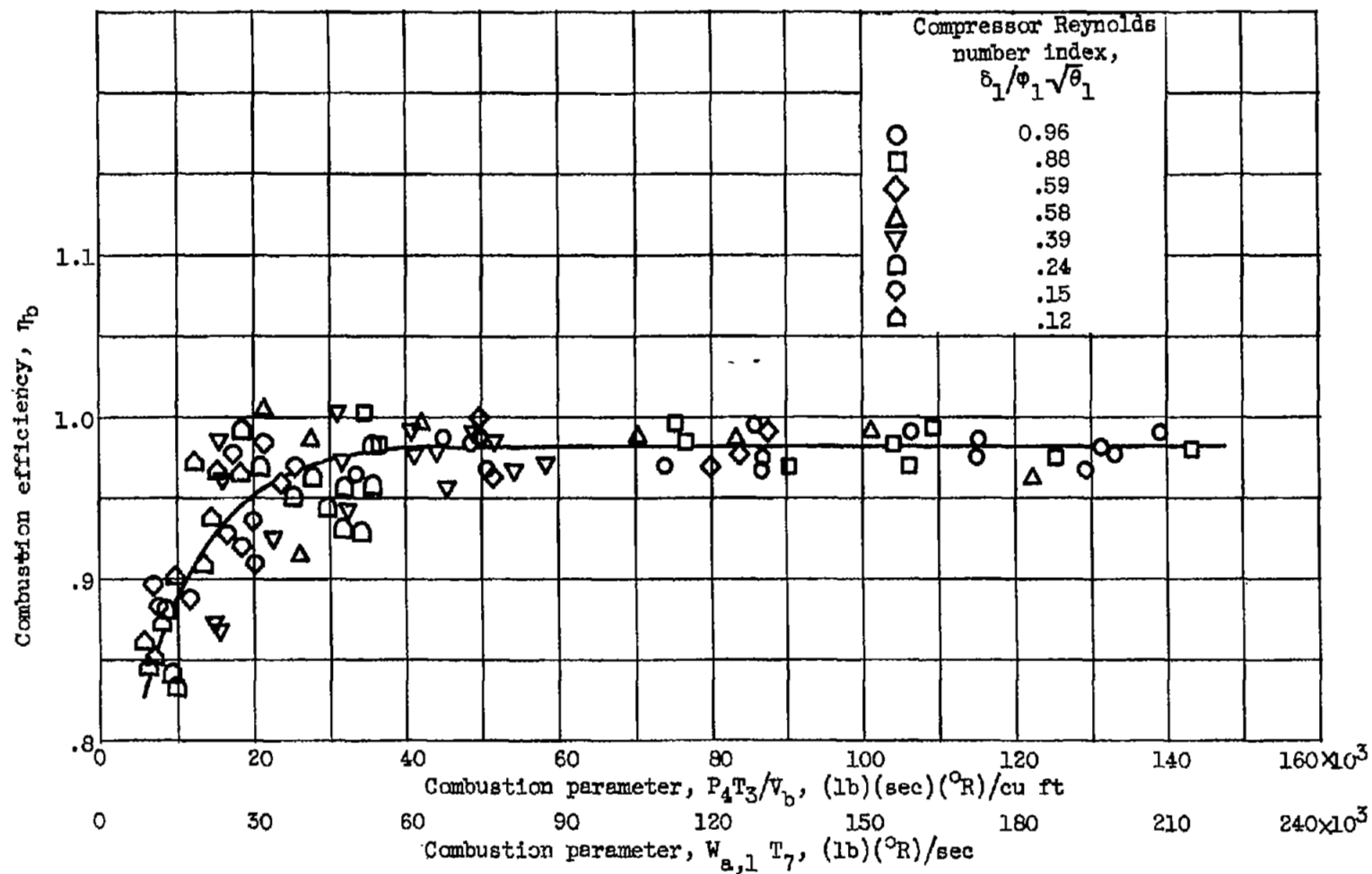


Figure 10. - Variation of combustion efficiency with combustion parameters.

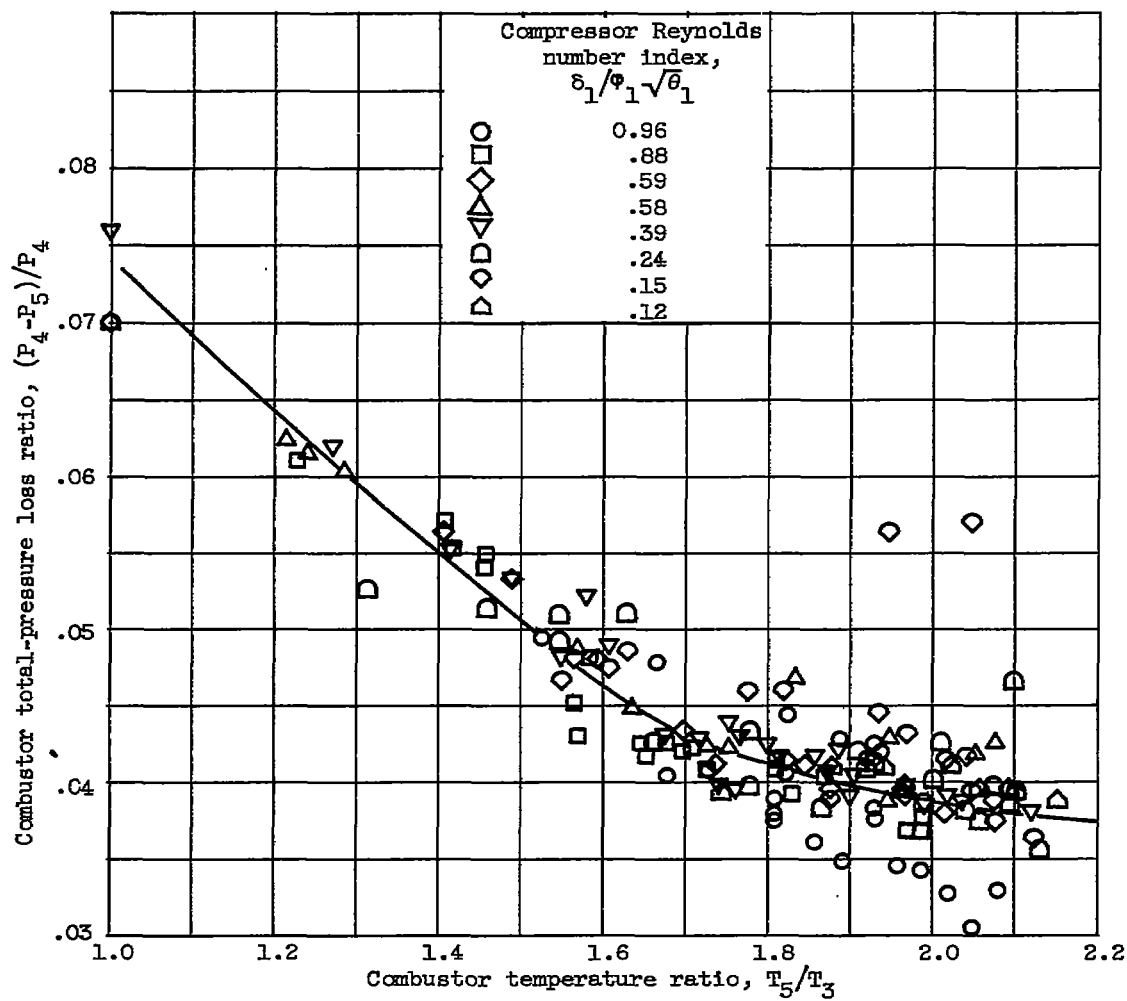


Figure 11. - Variation of combustor total-pressure loss ratio with combustor temperature ratio.

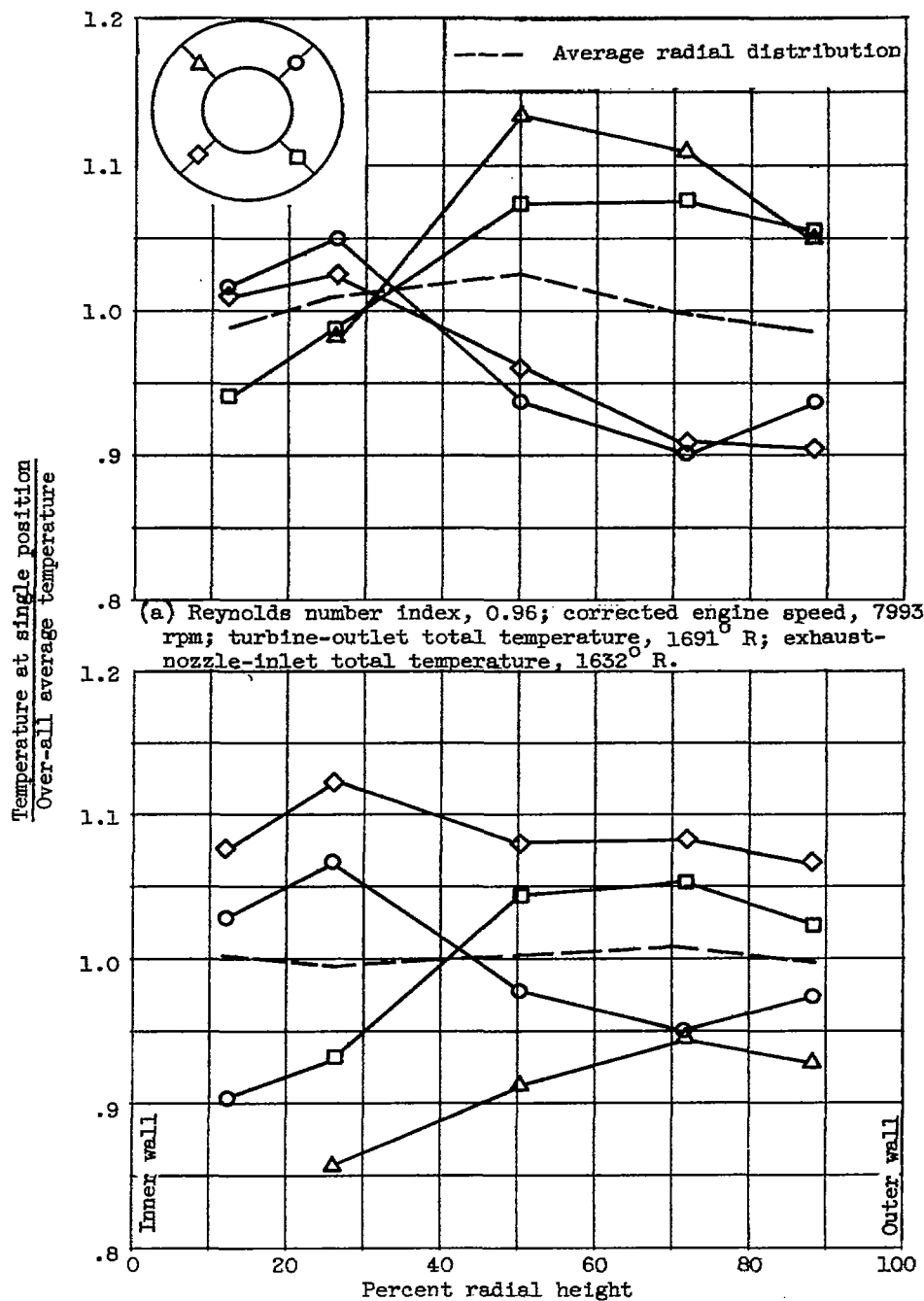


Figure 12. - Typical total-temperature profiles at turbine outlet, station 6.

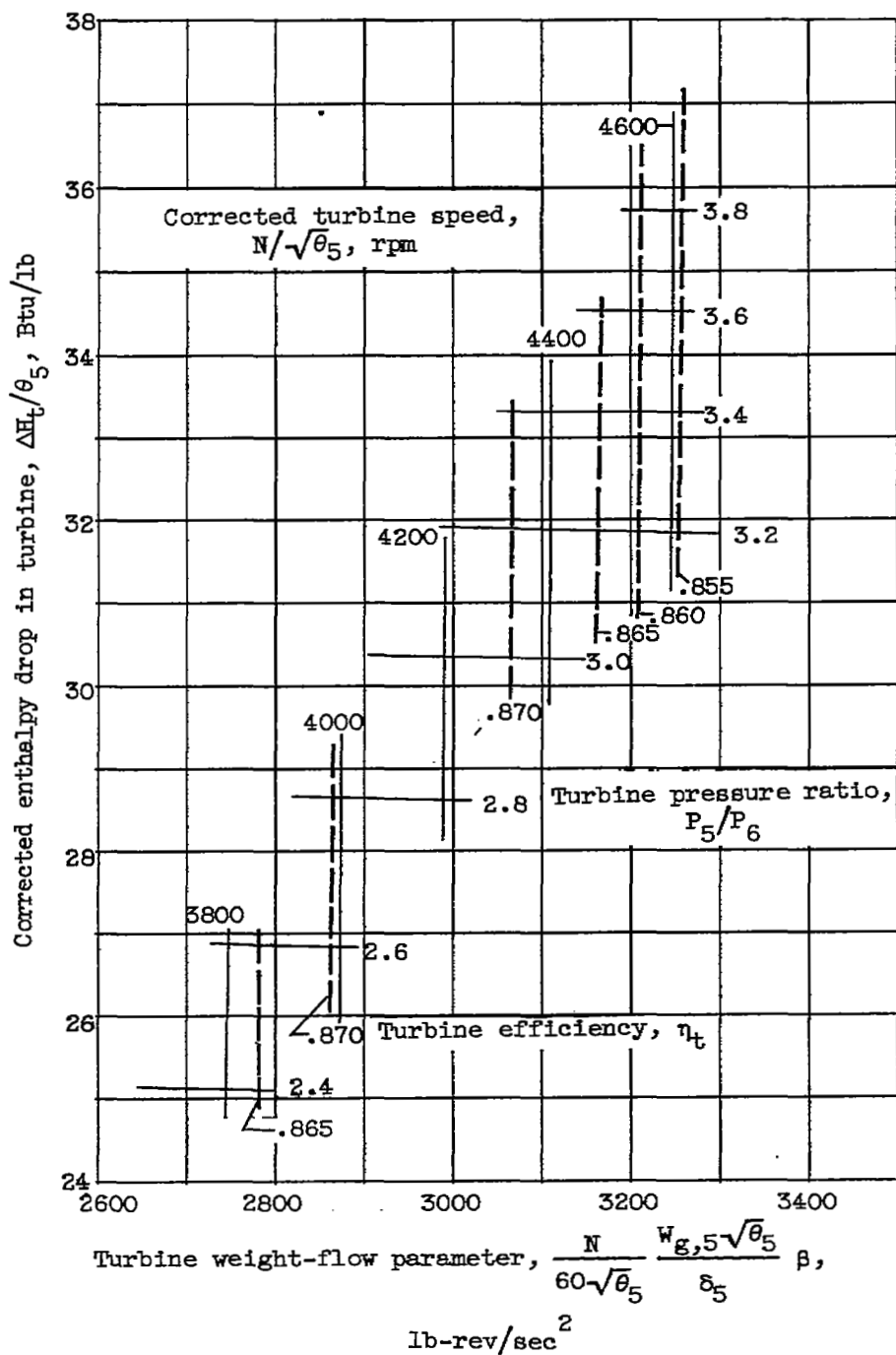


Figure 13. - Turbine performance map. Compressor Reynolds number indices of 0.96 and 0.88. Turbine Reynolds number indices varied as shown in table I.

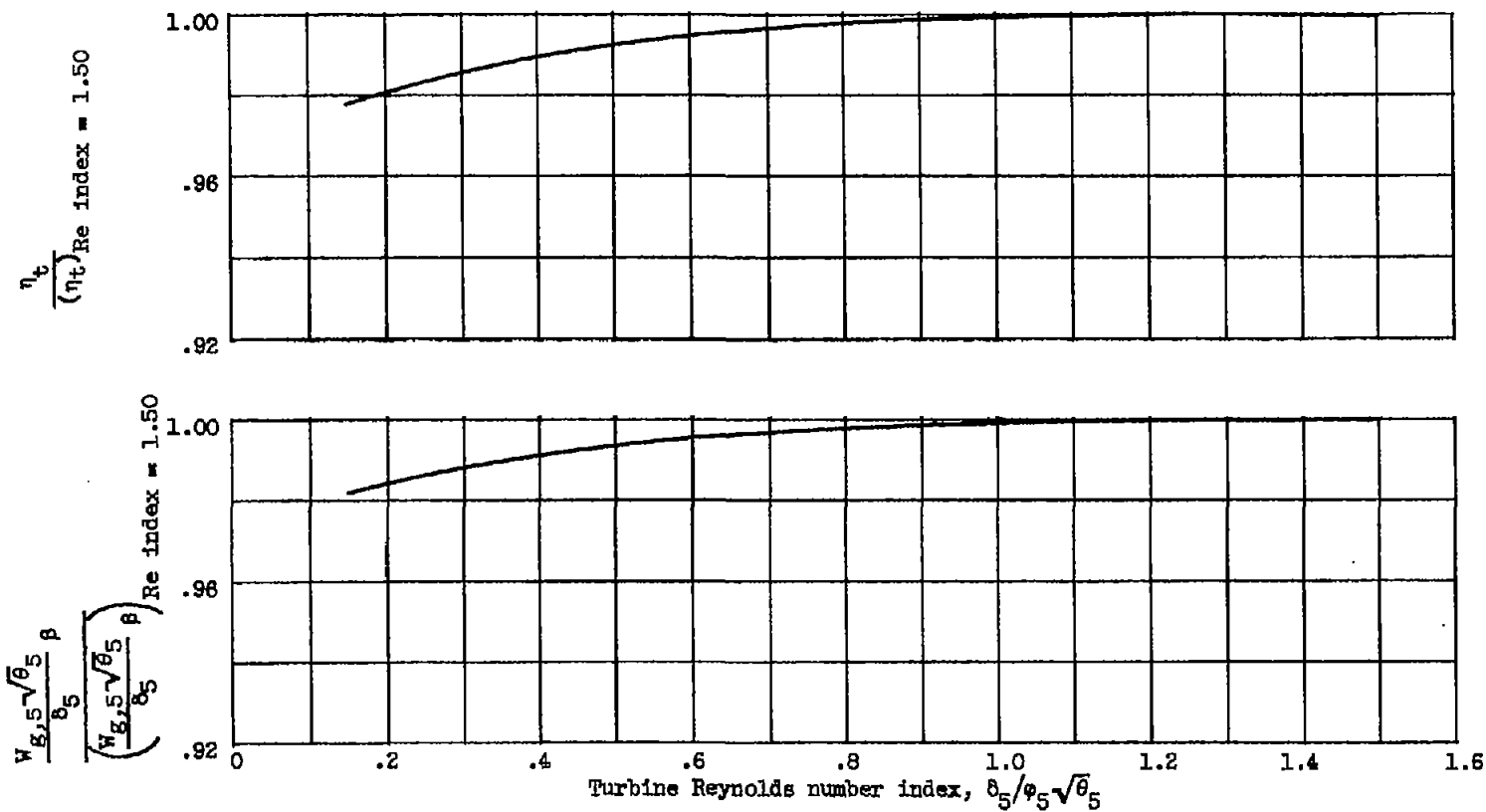


Figure 14. - Effect of turbine Reynolds number index on turbine efficiency and corrected turbine gas flow.

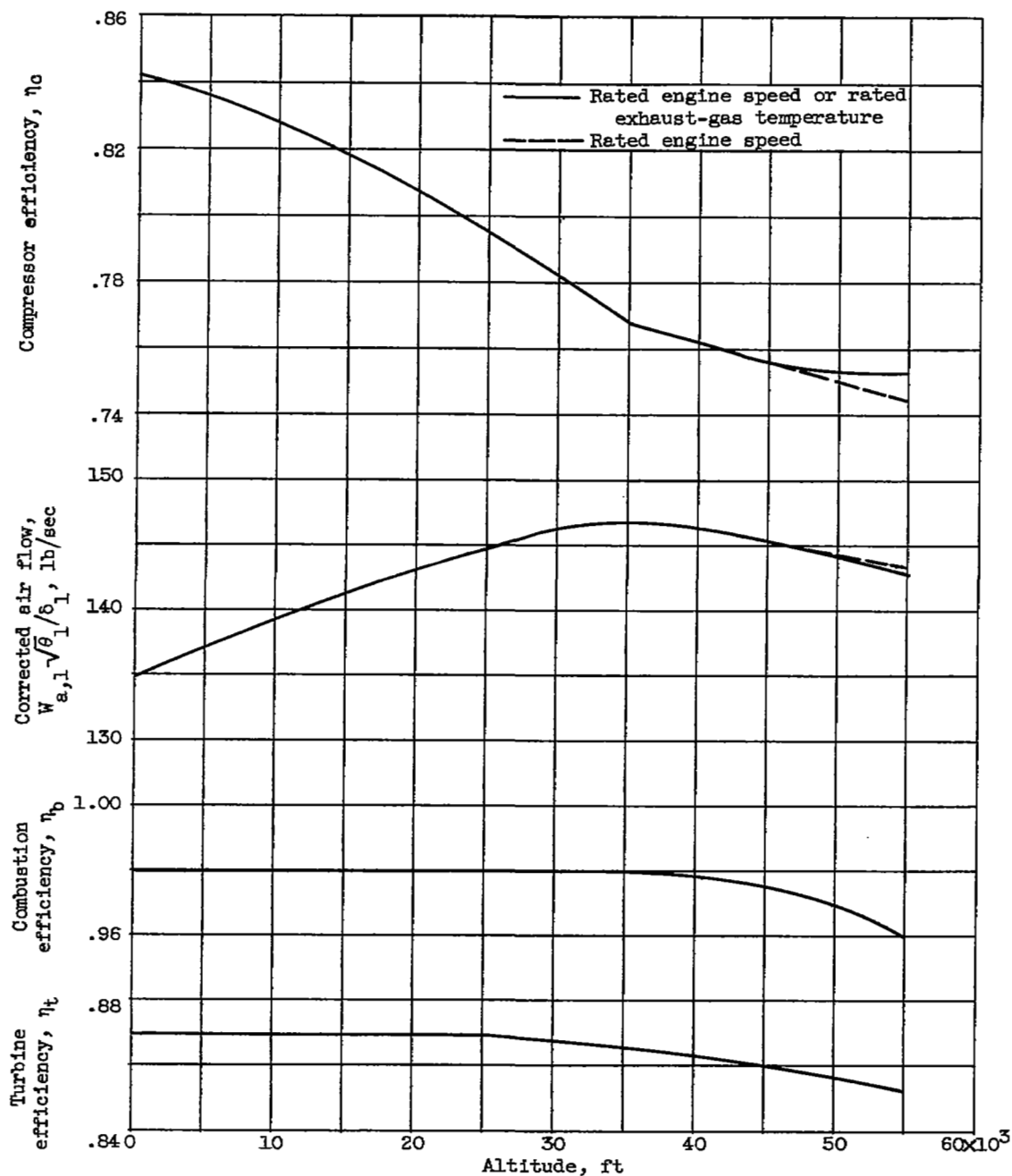


Figure 15. - Variation of compressor, combustor, and turbine efficiency and corrected air flow with altitude at rated engine conditions. Flight Mach number, 0.8.

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